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Evaluation of Method 5B at a Coal-Fired Boiler

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The report describes the development and evaluation of Method 5B at a coal-fired boiler. Different sampling and analysis techniques for measuring nonsulfuric acid particulate were compared and evaluated. Statistical analyses of the results comparing the precision of the different techniques are presented.

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Evaluation of Method 5B at a Coal-Fired Boiler

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air, Noise, and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

September 1983

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SECTION 1

INTRODUCTION

On June 28, 1979, the U.S. Environmental Protection Agency (EPA) issued an advance notice of proposed rulemaking to develop New Source Performance Standards (NSPS) for fossil-fuel-fired industrial steam generators.* Because these sources can emit significant amounts of condensible sulfates that are not controllable by even the best emission reduction systems, particulate emissions measured by Method 5, which is capable of collecting condensible matter, could vary widely as a result of fuel sulfur content or process changes. EPA decided that condensible sulfates should not be included in particulate emission standards or measurements. Therefore, the test program undertaken by EPA to support development of the NSPS had two objectives: 1) to obtain background emission data, and 2) to evaluate sampling and analytical parameters designed to minimize collection of condensible sulfate materials from these sources. Background emission data have been collected at several coal-fired facilities and at one oil-fired facility using both proposed Method 5B (to minimize collection of condensible sulfates) and Method 5.

* 44 FR 37632.

PEDCo Environmental, Inc., under contract to the Emission Measurement Branch of the EPA, conducted an atmospheric emission test program from November 29 through December 2, 1982, at the Monongahela Power Company (Mono Power) Pleasants Station in Willow Island, West Virginia. Testing was performed in the exit stack of Unit No. 1, a scrubbed 625-MW coal-fired utility boiler, in an effort to determine the precision of proposed Method 5B and to evaluate the effect of sampling and analysis parameters on the collection of condensible sulfates.

All samples were collected by use of a four-train (quad) sample system stationed at a single point in the exit stack. A total of 10 quad train tests were performed during the test series. Paired trains in the quad system consisted of similar sample methods to allow within-run data comparisons as well as comparisons between different sample methods.

To enable estimation of method precision, most of the samples were collected at Method 5B sampling conditions [filter and probe heated to 160°C (320°F)], designated as M5B.

Other sampling parameter studies have shown generally that 1) a higher sampling temperature can minimize collection of condensible matter, and 2) even a well designed, constructed, and operated probe heating system can have cold spots where the gas temperature is lower than the desired monitored probe temperature. Consequently, several of the quad test runs were conducted with the probe heated to 204°C (400°F) in an effort to raise the temperature of any cold spots in the probe to approximately 160°C

(320°F), the desired filter temperature. These samples were designated as M5B-P400.

Probe rinse and filter sample fractions collected by Methods 5B and 5B-P400 were subjected to a series of thermogravimetric analyses to assess sample weight loss as a function of heating temperature between ambient conditions and 316°C (600°F).

In addition, several samples (designated M5BW) were collected and analyzed by use of a modified version of Texas Air Control Board (TACB) Method 5W.* The method incorporates deionized water as the sample recovery solvent and a series of titrimetric and gravimetric analyses to measure water-soluble sulfates and subsequently derive the mass of nonwater-soluble sulfate particulate (particulate matter that does not include any water-soluble sulfates). The method was modified by sampling at 160°C (320°F) and measuring the water-soluble sulfates by ion chromatography (IC). These tests were conducted to determine the suitability of the method on fossil-fuel-fired steam generators, since previous studies[1,2] have confirmed the suitability of Method 5W and the IC analysis modification for use on fluid catalytic cracking unit regenerators at petroleum refineries that also can emit significant amounts of condensible sulfates.

Ion chromatography was used to check the effectiveness of sample heat conditioning in the elimination of condensible sulfates by analyzing water extracts of heat-conditioned M5B and M5B-P400 probe rinse and filter samples.

*Texas Air Control Board - Laboratory Division. Determination of Particulate in Stack Gases Containing Sulfur Dioxide. December 1979.

The filterable portion of each sample train was followed by a modified EPA Method 8 impinger train to allow analysis of condensible sulfate [as sulfuric acid (H_2SO_4)] that passed through the particulate filter and sulfur dioxide (SO_2). Flue gas temperature, moisture content, and composition [oxygen (O_2) and carbon dioxide (CO_2)] were measured in conjunction with the emission tests.

Mr. H. A. Ruckle of Mono Power provided assistance on site, and Mr. Gary McAlister, the EPA Task Manager, provided overall project coordination.

This report documents the activities and results of the test program. Section 2 briefly describes the process and operating conditions during the sampling periods. Section 3 describes the sampling site and the sampling and analytical plan. Section 4 presents the test results and is followed by a discussion of results in Section 5. Section 6 outlines quality assurance measures and audit results. The appendices contain computer output and example calculations (Appendix A), field data (Appendix B), analytical data (Appendix C), standard sampling and analytical procedures (Appendix D), calibration procedures and results (Appendix E), a quality assurance summary (Appendix F), and a list of project participants (Appendix G).

SECTION 2

PROCESS OPERATION

The source tested in this program is a 625 net MW coal-fired utility boiler (designated as Pleasants No. 1) operated by Mono Power at the plant facility located near Parkersburg, West Virginia. The unit is equipped with two parallel electrostatic precipitators (ESP's) with a combined total of four fields for control of particulate matter and a flue gas desulfurization (FGD) system for control of sulfur dioxide emissions. Treated flue gases are exhausted through a 244-m (800-ft) tall stack. Typical coal burned in the boiler contains 3.5 percent sulfur.

The FGD consists of four modules, a combination of which are operated to treat a variable amount of flue gas. Operators generally control the quantity of flue gas that is scrubbed by monitoring the stack temperature. An increase in gas temperature is an indication of an increase in stack SO_2 concentration.

Process conditions during the sampling periods are summarized in Table 2-1. Although each quad test was not conducted at the same boiler load, only Run 2 was conducted when the load varied by more than ±10 percent over the sampling period. Operation of the ESP was considered normal throughout the test program as no malfunctions were reported. The SO_2 scrubber operation was generally consistent for the first five tests. During the last

TABLE 2-1. PROCESS DATA SUMMARY

Run No.	Date (1982)	Time, 24-h	Net load, MW		Stack monitor SO_2, ppm		ESP operation	Scrubber operation
			Range	Average	Range	Average		
1	11/29	1130-1330	Steady	500	NR[a]	NR	Normal	Normal
2	11/29	1525-1725	360-500	400[b]	420-460	440	Normal	Normal
3	11/30	1018-1218	500-575	520[c]	350-450	420	Normal	Normal
4	11/30	1328-1528	550-575	570[d]	300-450	410	Normal	Normal
5	11/30	1636-1836	Steady	575	Steady	450	Normal	e
6	12/1	941-1141	Steady	620	400-450	425	Normal	f
7	12/1	1242-1442	Steady	620	385-525	455	Normal	f
8	12/1	1545-1810	Steady	620	400-450	425	Normal	f
9	12/2	931-1131	Steady	620	Steady	400	Normal	g,h
10	12/2	1304-1504	Steady	620	Steady	375	Normal	g,i

[a] NR = Not recorded.

[b] Load increased over a 1-hour span during test.

[c] Load increased over a ½-hour span during test.

[d] Load decreased, then increased over a 1-hour span during test.

[e] Prior to testing, the scrubber bypass was opened from 20 to 35 percent.

[f] Minor adjustments being made to scrubber throughout the day.

[g] Scrubber pH meter broken; scrubber liquor feed on manual control.

[h] Stack temperature was up about 11°C (20°F) over a 20-minute period during the test.

[i] The scrubber liquor feed was interrupted twice during the test for about 2 minutes each time. This caused the stack pressure to go positive and the stack velocity and temperature to increase.

five tests, there were periods of minor scrubber adjustments, manual operation of liquor feed due to a malfunctioning pH meter, and very brief interruptions of liquor feed. None of the relatively minor process variations should affect the within-run data comparisons.

SECTION 3

SAMPLING AND ANALYTICAL PLAN

All samples were collected with a four-train (quad) sample system stationed at a single point in the final exit stack.

This system allows four trains to sample simultaneously at essentially the same point in the stack (see Figure 3-1). The sample methodology was developed and validated in previous studies.[3] The ability of the four trains to sample simultaneously at essentially the same point in the stack reduces the effect of spatial and temporal variations in the velocity and particulate profiles on the sampling results. It also permits a statistically significant number of samples to be taken in a short time. Further, because two of the four trains are identical for every run, the within-train precision can be determined while the relationship of the different trains is being compared.

This four-train sample system was used to perform 10 runs, for a total of 40 individual samples.

3.1 SAMPLE LOCATION

Testing took place at the final exit stack, as depicted in Figure 3-2. Six sample ports were located approximately 9.5 duct diameters downstream and 25 duct diameters upstream from the nearest flow disturbances. Only the 25.4-cm (10-in.) I.D. south-

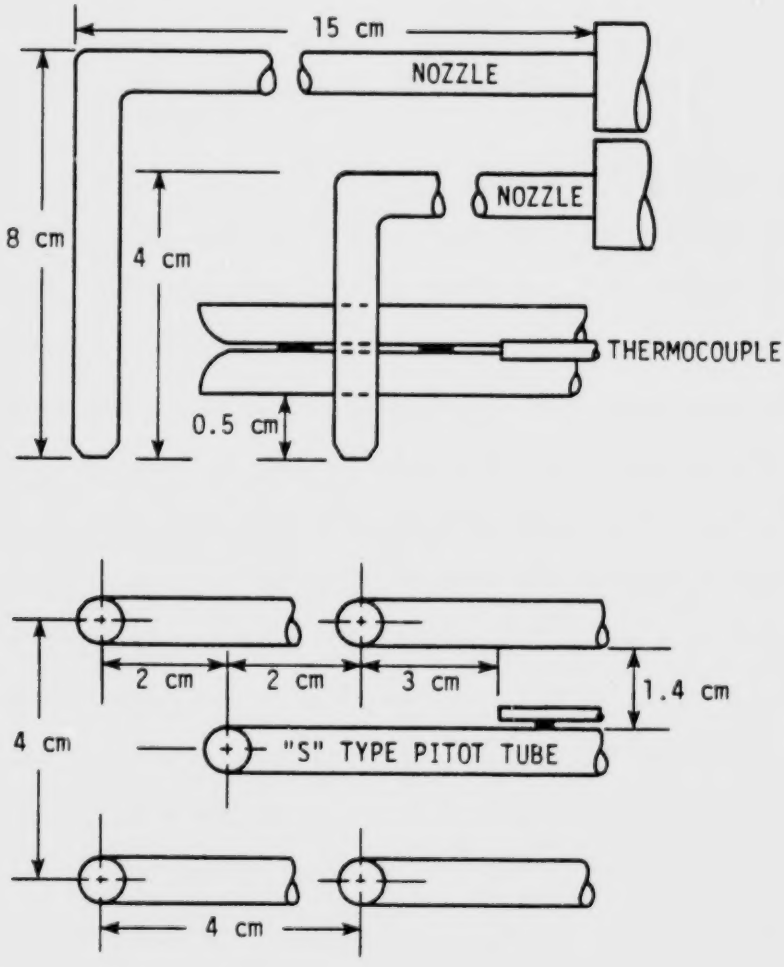

Figure 3-1. Four-train sampling system showing nozzle position.

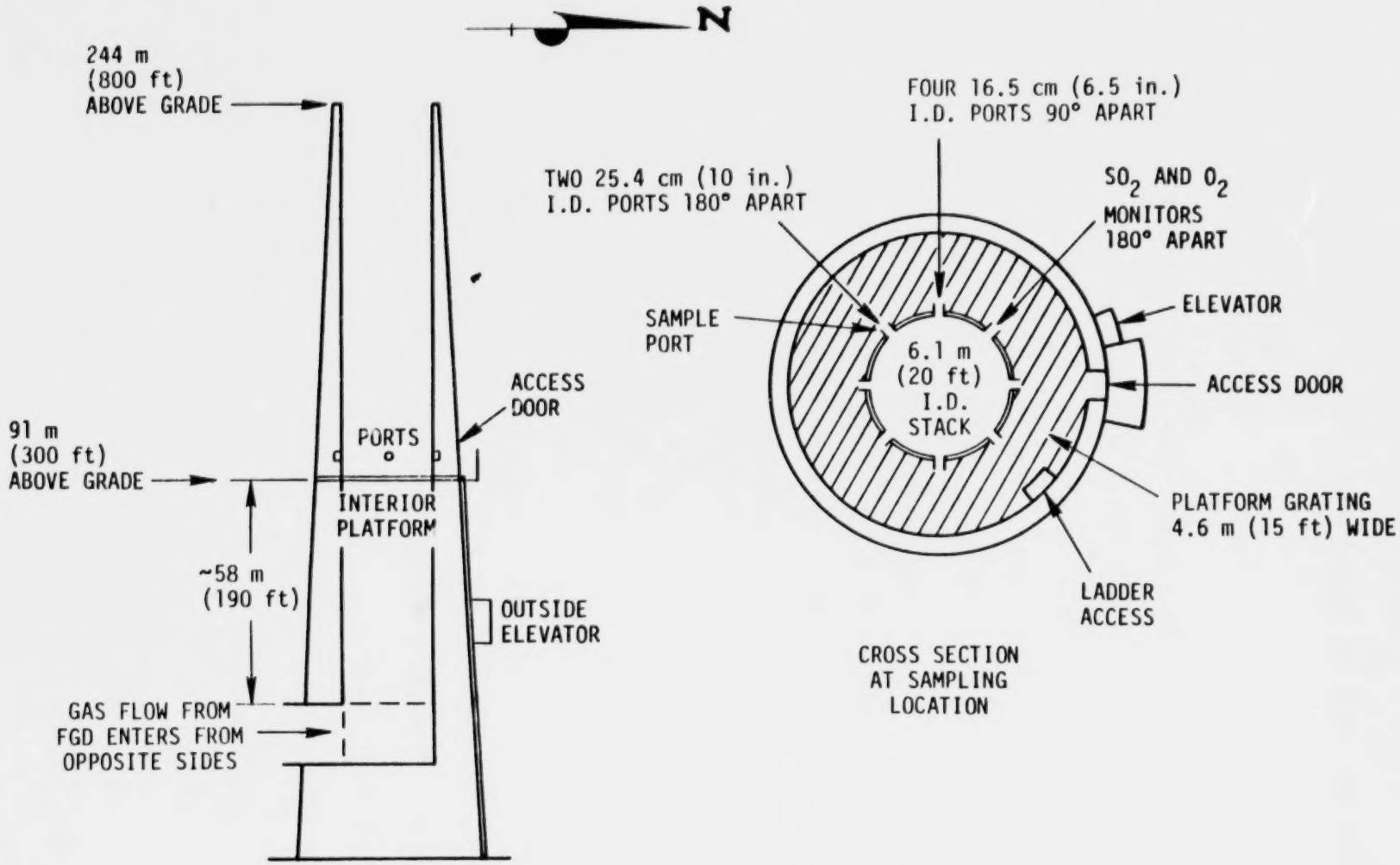

Figure 3-2. Pleasants No. 1 sampling site.

west port was used in this study. All port nipples were 31.8 cm (12.5 in.) long.

3.2 SAMPLE METHODS

The four trains collected flue gas samples simultaneously from a single point in the stack. The nozzles of the four-train assembly (Figure 3-1) were positioned 66 cm (26 in.) from the stack wall for the first test and, after removing a barrier, 81 cm (32 in.) from the stack wall for each subsequent test. The desired sample time was 120 minutes, and readings of stack flue gas and sampling train data were recorded at 10-minute intervals for each train. A single pitot tube and thermocouple located in the four-train nozzle arrangement was used to set isokinetic sample rates for each train. Sample rates were determined by use of programmable calculators. Prior to sampling, the velocity and temperature profile of the general sampling area was established to ensure that all four nozzles could be positioned at points of equal velocity to minimize spatial variations in emissions.

Table 3-1 presents the sample matrix performed during this test series. The particular conditions for each train are described briefly below:

- Method 5B - Designation M5B

  Filterable particulate was collected by use of a probe and filter assembly heated to 160°C (320°F). Acetone was used to rinse all sample train components prior to the filter.

TABLE 3-1. SAMPLE MATRIX

Run No.	Sample Train No.	Sample method[a]		
		M5B 160°C (320°F)	M5B-P400 160°-204°C (320°-400°F)	M5BW 160°C (320°F)
1	1A	X		
	1B	X		
	1C			X
	1D			X
2	2A		X	
	2B		X	
	2C	X		
	2D	X		
3	3A			X
	3B			X
	3C	X		
	3D	X		
4	4A	X		
	4B	X		
	4C		X	
	4D		X	
5	5A	X		
	5B	X		
	5C	X		
	5D	X		
6	6A	X		
	6B	X		
	6C			X
	6D			X

(continued)

TABLE 3-1 (continued)

Run No.	Sample Train No.	Sample method[a]		
		M5B 160°C (320°F)	M5B-P400 160°-204°C (320°-400°F)	M5BW 160°C (320°F)
7	7A		X	
	7B		X	
	7C	X		
	7D	X		
8	8A			X
	8B			X
	8C	X		
	8D	X		
9	9A	X		
	9B	X		
	9C		X	
	9D		X	
10	10A	X		
	10B	X		
	10C	X		
	10D	X		

[a]M5B - Probe and filter heated to 160°C (320°F).
M5B-P400 - Probe heated to 204°C; filter heated to 160°C.
M5BW - Probe and filter heated to 160°C; water rinse of nozzle, probe, and front filter holder glassware.

- Modified Method 5B - Designation M5B-P400

  Filterable particulate was collected by use of a probe heated to 204°C (400°F) and a filter assembly heated to 160°C (320°F). Acetone was used to rinse all sample train components prior to the filter.

- Method 5BW - Designation M5BW

  Filterable particulate was collected by use of a probe and filter assembly heated to 160°C (320°F). Deionized, distilled water was used to rinse all sample train components prior to the filter.

The purpose of heating the probe to 204°C while keeping the filter at 160°C was an effort to raise the temperature of any cold spots in the probe to 160°C, thus minimizing the quantity of condensible sulfates collected.

For each train, the probe and filter temperatures were set at the predetermined level and monitored throughout each test by the use of multiterminal digital indicators with the thermocouples located in the middle of each probe and immediately behind the Method 5 filter frits.

The back half of each sample train represented a modified Method 8 with five impingers. An unheated Method 5 filter assembly was inserted between the second and third impingers to preclude any sulfuric acid mist carryover. The contents of each impinger are listed below:

Impinger	Contents - All Runs
1	Empty
2	200 ml 80% IPA
3	100 ml 10% H_2O_2
4	100 ml 10% H_2O_2
5	400 grams silica gel

All the filters were Whatman RA 934AH. The filters used in the Method 5 position were heated to 300°C prior to identification and tare weighing.

The flue gas moisture content of each sample train was determined gravimetrically by weighing each impinger before and after every test. In addition, a flue gas grab sample collected during each test was analyzed for oxygen (O_2), and carbon dioxide (CO_2) by use of an Orsat analyzer, as described in Method 3* of the Federal Register.

3.3 SAMPLE ANALYSIS

Table 3-2 presents the analytical matrix followed for this test program.

Thermogravimetric Analysis

Initially, the filter particulate catch was placed in a tared glass weighing dish, desiccated for 24 hours, and weighed to a constant weight.** The probe rinse fraction was transferred to a tared beaker, allowed to evaporate to dryness at ambient temperature and pressure, desiccated for 24 hours, and weighed to a constant weight.

After this initial gravimetric analysis at ambient conditions, probe rinse and filter fractions were subjected to the sequence of heat treatments outlined in Table 3-2. The samples

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* 40 CFR 60, Appendix A, Reference Method 3, July 1, 1981.

** Criteria as specified in 40 CFR 60, Appendix A, Reference Method 5, July 1, 1981.

TABLE 3-2. ANALYTICAL MATRIX

Run No.	Sample Train No.	Sample method	Thermogravimetric conditioning[a]			Water soluble sulfate determination[b]
			Ambient → 160° → 232° → 316°C	Ambient → 232° → 316°C	Ambient → 316°C	
1	1A	M5E	X			X
	1B	M5B	X			X
	1C	M5BW				X
	1D	M5BW				X
2	2A	M5B-P400	X (24)			X
	2B	M5B-P400	X			X
	2C	M5B	X (24)			X
	2D	M5B	X			X
3	3A	M5BW				X
	3B	M5BW				X
	3C	M5B			X	X
	3D	M5B			X (24)	X
4	4A[c]	M5B		X		
	4B[c]	M5B			X	
	4C[c]	M5B-P400		X		X
	4D[c]	M5B-P400			X	
5	5A[c]	M5B	X			X
	5B[c]	M5B	X (24)			
	5C[c]	M5B		X		
	5D[c]	M5B		X (24)		
6	6A	M5B	X			X
	6B	M5B	X			X
	6C	M5BW				X
	6D	M5BW				X

(continued)

TABLE 3-2 (continued)

Run No.	Sample Train No.	Sample method	Thermogravimetric conditioning[a]			Water soluble sulfate determination[b]
			Ambient → 160° → 232° → 316°C	Ambient → 232° → 316°C	Ambient → 316°C	
7	7A[c]	M5B-P400	X			
	7B[c]	M5B-P400	X (24)			
	7C	M5B	X			
	7D	M5B	X (24)			X
8	8A	M5BW				X
	8B	M5BW				X
	8C	M5B	X (24)			X
	8D	M5B	X (24)			X
9	9A[c]	M5B			X (24)	
	9B	M5B		X (24)		X
	9C[c]	M5B-P400			X (24)	
	9D[c]	M5B-P400		X (24)		
10	10A[c]	M5B	X (24)			
	10B	M5B	X			
	10C[c]	M5B		X (24)		X
	10D	M5B		X		

[a] Thermogravimetric conditioning of probe rinse and filter fractions at indicated temperatures after initial desiccation and ambient weights were obtained. The designation (24) for selected samples indicates a heat period of 24 hours. All other samples were heat-conditioned for 6 hours.

[b] In this procedure, the mass of total water soluble sulfates in the sample was determined and subtracted from the total sample mass.

[c] These samples subsequently were heated to 400°C for two 6 hour periods.

Note: All back halves represent a modified Method 8, with analysis for sulfates as sulfuric acid and sulfur dioxide.

were heated in an oven at the specified temperature for either 6 or 24 hours as indicated. Each sample fraction was cooled and desiccated for 24 hours after removal from the oven and then weighed to the nearest 0.1 mg.

Prior to advancing to the next step of an analytical sequence, a heat treatment was repeated at the same time and temperature condition until a stable weight was obtained. For this study, a stable weight was defined as a difference of no more than 5.0 mg or 10 percent of the net sample weight, whichever was greater, between successive treatments at the same conditions. The number of treatments required to achieve a stable weight was recorded for each sample fraction up to a maximum of three treatments. The average weight of the last two treatments was reported as the weight for that temperature condition. Filter and acetone blanks were treated in a similar manner as the actual samples.

Water-Soluble Sulfate Analysis

Sample Preparation--

Each sample fraction, including blanks, was handled and analyzed as follows:

> Filter - The filter was cut into small pieces and placed in a 125-ml Erlenmeyer flask with a standard taper joint equipped with an air condenser. The shipping container was rinsed into the flask. About 50 ml of distilled water was added and gently refluxed for 6 to 8 hours. The solution was then cooled and diluted to exactly 250 ml with water in a volumetric flask. This was reserved for total soluble sulfate analysis, which is described below.

Probe Rinse - The probe wash was poured into a 250-ml volumetric flask. The sample bottle was rinsed with distilled water and the rinsings were added to the flask. The solution was then diluted to the mark with distilled water (or, if greater than 250 ml, the volume was measured). This solution was reserved for total soluble sulfate analysis, which is described below.

Total Soluble Sulfate Analysis--

A 15-ml aliquot* was drawn from the settled samples (filter and rinse) into separate sample containers with a clean, dry pipet (only solution was transferred, no solids; if necessary, a portion of the sample was centrifuged). The sulfate ion ($SO_4^=$) concentration in each aliquot was determined by ion chromatography (IC). A syringe was used to inject 1 ml of the aliquot into the 100-µl sample loop of the IC, thereby flushing the loop with sample. The conductivity response of the sample was compared with the calibration curve to obtain $SO_4^=$ concentration in mg/liter. Dilutions were prepared and reanalyzed if the initial response was out of the linear calibration range (i.e., greater than 15 mg/liter). Blank filter and water samples were prepared and analyzed in the same manner as the actual samples.

Mass Determination--

Filter and Rinse Solution Preparation - The remaining contents of each volumetric flask (235 ml) were poured into separate tared 250-ml beakers and the flask was rinsed with distilled water to transfer all particulate matter. The filter solution was in Beaker A and the rinse solution was in Beaker B. This solution was evaporated to approximately 100 ml at 105°C and allowed to cool before proceeding with the next analysis.

*The pipet is not rinsed. This is a deviation from normal procedures, but is necessary because the volume removed from the volumetric flask is required in the calculations.

Filter and Rinse Solution Analysis - Five drops of phenolphthalein indicator were added to all the tared beakers. Concentrated NH_4OH was then added drop by drop until the solution turned pink. The samples were returned to the oven and evaporated to dryness at 105°C, then cooled in a desiccator and weighed to a constant weight. Results were reported to the nearest 0.1 mg. For this method, "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less beaker and/or filter tare, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Calculations--

Nomenclature--

FP = weight of particulate* on the filter in Beaker A, mg

PRP = weight of probe rinse particulate* in Beaker B, mg

NWSSP = weight of nonwater-soluble sulfate particulate**, mg

AS_f = weight of ammonium sulfate in filter sample, mg

AS_{pr} = weight of AS in probe rinse sample, mg

V_{evap} = volume of solution evaporated in Beaker A (filter) or Beaker B (probe rinse), ml

C_{SO_4} = concentration of sulfate in filter or probe rinse solution aliquots, mg/liter

Equations--

$$FP(mg) = \text{gross weight Beaker A} - \text{tare weight Beaker A} - \text{filter tare weight} \qquad \text{Eq. 1}$$

$$PRP(mg) = \text{Gross weight Beaker B} - \text{tare weight Beaker B} \qquad \text{Eq. 2}$$

$$AS(mg) = C_{SO_4}\ (mg/liter) \times V_{evap}\ (ml) \times \frac{liter}{1000\ ml} \times 1.376\ \left(\frac{mg\ AS}{mg\ SO_4}\right) \qquad \text{Eq. 3}$$

*Particulate with H_2SO_4 converted to $(NH_4)_2SO_4$.

**Particulate excluding water-soluble sulfates.

Mass of Nonwater-Soluble Sulfate Particulate

The sum of the particulate* collected on the filter (FP) and the particulate* collected in the probe rinse (PRP) is equal to the sum of nonwater-soluble sulfate particulate (NWSSP) and ammonium sulfate (AS) in both samples:

$$FP + PRP = NWSSP + AS_f + AS_{pr} \qquad \text{Eq. 4}$$

The NWSSP can be found by rearranging the equation and substituting appropriate values determined using Equations 1, 2, and 3.

$$NWSSP = FP + PRP - AS_f - AS_{pr} \qquad \text{Eq. 5}$$

Sulfate Analysis by Ion Chromatography

Selected within-run samples, heat-conditioned to 316°C, were extracted with distilled water and aliquots were analyzed for total sulfate by ion chromatography for comparison to Method 5BW results.

Sulfuric Acid Mist Analysis

The amount of sulfuric acid that passed through the particulate filter was determined by analyzing the IPA solution recovered in the first two impingers and the backup filter. The volume of the sample solution was recorded and the pH of the sample determined. The sample volume was diluted to 500 ml with 80 percent IPA. A 100-ml aliquot of this solution was pipetted

*Particulate with H_2SO_4 converted to $(NH_4)_2SO_4$.

into a 250-ml Erlenmeyer flask with 2 to 3 drops of thorin indicator and titrated to a pink end point using 0.0100 N barium perchlorate. If the end point color was not correct, the sample was passed through an ion exchange column and retitrated. A blank was titrated for each sample in the same manner.

Sulfur Dioxide Analysis

The hydrogen peroxide sample solution was diluted to 500 ml with deionized, distilled water. A 20-ml aliquot of this solution was pipetted into a 250-Erlenmeyer flask with 80 ml of 100 percent IPA and 2 to 3 drops thorin indicator. The solution was then titrated to a pink end point using 0.0100 N barium perchlorate. A blank was titrated in the same manner.

SECTION 4

SUMMARY OF TEST RESULTS

This section summarizes the results of the field sampling program. They are presented to allow both within-run and between-run data comparisons, with emphasis on the thermogravimetric and water-soluble sulfate test results.

4.1 SAMPLE DATA

Table 4-1 summarizes pertinent sample data. All tests were conducted at a single point where the stack gas velocity profile was relatively flat. The actual probe and filter temperatures, stack temperature, and moisture content represent average values from each individual sample train. Gas composition data (O_2 and CO_2) are given in percent by volume on a dry basis. The isokinetic criteria defined in Reference Method 5* were met in each case, as indicated by the values shown in the far right-hand column.

4.2 THERMOGRAVIMETRIC ANALYTICAL RESULTS

Table 4-2 presents the thermogravimetric analytical results. The filterable particulate values represent material collected in the sample probe and on the filter for each sample type (M5B,

*40 CFR 60, Appendix A, July 1, 1981.

TABLE 4-1. SUMMARY OF SAMPLE CONDITIONS

Test No.	Date (1982) and time (24-h)	Train I.D.	Sample[a] type	Sample temperature, °C (°F)			Metered volume[c] dNm^3 (dscf)	Average stack temperature, °C (°F)	Moisture content, %	Average molecular weight, g/g-mole	% CO_2	% O_2	Isokinetic sampling rate, %
				Probe		Filter[b], actual							
				Desired	Actual								
1[d]	11/29 11:30- 13:30	1A 1B 1C 1D	M5B M5B M5Bw M5Bw	160 (320) 160 (320) 160 (320) 160 (320)	164 (327) 172 (342) 159 (319) 159 (318)	161 (323) 157 (315) 159 (318) 163 (326)	2.160 (76.3) 2.121 (74.9) 2.082 (73.5) 2.079 (73.4)	63.3 (146)	12.25 15.79 11.47 8.61	12.03	12.10	6.90	102.4 102.9 94.9 95.4
2	11/29 15:25- 17:25	2A 2B 2C 2D	M5B-P400 M5B-P400 M5B M5B	204 (400) 204 (400) 160 (320) 160 (320)	199 (390)[e] 174 (346)[f] 165 (329) 164 (327)	168 (335) 169 (336) 161 (322) 163 (326)	2.056 (72.6) 2.013 (71.1) 1.986 (70.1) 1.962 (69.3)	67.7 (154)	9.70 12.11 12.20 12.32	11.58	11.75	6.65	100.5 105.8 101.6 98.3
3	11/30 10:18- 12:18	3A 3B 3C 3D	M5Bw M5Bw M5B M5B	160 (320) 160 (320) 160 (320) 160 (320)	162 (323) 166 (330) 158 (324) 157 (315)	163 (325) 164 (327) 162 (324) 162 (324)	3.222 (113.8) 3.188 (112.6) 3.116 (110.0) 3.158 (111.5)	69.4 (157)	10.93 10.39 12.21 11.97	11.66	12.60	6.15	98.1 97.4 96.8 98.8
4	11/30 13:28- 15:28	4A 4B 4C 4D	M5B M5B M5B-P400 M5B-P400	160 (320) 160 (320) 204 (400) 204 (400)	167 (332) 157 (315) 206 (402) 206 (402)	167 (332) 168 (335) 161 (322) 163 (326)	3.440 (121.5) 3.398 (120.0) 3.391 (119.7) 3.454 (122.0)	73.9 (165)	10.28 10.45 12.87 12.43	11.51	12.90	5.80	97.7 95.8 98.5 98.1
5	11/30 16:36- 18:36	5A 5B 5C 5D	M5B M5B M5B M5B	160 (320) 160 (320) 160 (320) 160 (320)	163 (326) 163 (326) 162 (324) 160 (320)	164 (328) 165 (329) 159 (319) 162 (323)	3.343 (118.1) 3.332 (117.7) 3.250 (114.8) 3.250 (114.8)	76.1 (169)	11.19 11.06 11.67 11.67	11.40	11.90	6.80	97.8 98.2 97.2 97.2
6	12/01 9:41- 11:41	6A 6B 6C 6D	M5B M5B M5Bw M5Bw	160 (320) 160 (320) 160 (320) 160 (320)	163 (325) 158 (316) 168 (334) 161 (322)	166 (331) 165 (329) 159 (318) 158 (316)	3.178 (112.2) 3.172 (112.0) 3.138 (110.8) 3.210 (113.4)	71.7 (161)	12.46 12.85 13.32 13.02	12.91	12.87	5.60	100.4 99.7 100.0 100.1
7	12/01 12:42- 14:42	7A 7B 7C 7D	M5B-P400 M5B-P400 M5B M5B	204 (400) 204 (400) 160 (320) 160 (320)	207 (404) 204 (400) 164 (327) 157 (314)	167 (333) 167 (332) 162 (323) 160 (320)	3.292 (116.2) 3.276 (115.7) 3.132 (110.6) 3.262 (115.2)	72.8 (163)	12.13 12.87 12.76 12.16	12.48	12.53	6.00	99.0 100.1 96.5 99.9
8	12/01 15:45- 18:10	8A 8B 8C 8D	M5Bw M5Bw M5B M5B	160 (320) 160 (320) 160 (320) 160 (320)	162 (324) 159 (319) 174 (346) 168 (335)	162 (324) 163 (325) 158 (316) 159 (319)	3.199 (113.0) 3.159 (111.6) 3.125 (110.4) 3.251 (114.8)	72.8 (163)	13.68 11.96 12.43 12.64	12.68	12.75	5.70	101.8 98.0 98.3 100.6
9	12/02 9:31- 11:31	9A 9B 9C 9D	M5B M5B M5B-P400 M5B-P400	160 (320) 160 (320) 204 (400) 204 (400)	167 (332) 162 (325) 208 (407) 205 (402)	166 (330) 166 (330) 160 (320) 161 (321)	3.298 (116.5) 3.261 (115.2) 3.174 (112.1) 3.251 (114.8)	77.2 (171)	12.18 12.57 12.54 12.89	12.55	12.90	5.75	99.6 99.7 97.9 100.6
10	12/02 13:04- 15:04	10A 10B 10C 10D	M5B M5B M5B M5B	160 (320) 160 (320) 160 (320) 160 (320)	163 (326) 151 (304) 168 (334) 164 (327)	169 (336) 168 (335) 157 (315) 154 (309)	3.326 (117.5) 3.302 (116.6) 3.243 (114.5) 3.352 (118.4)	75.6 (168)	13.22 13.06 13.37 13.30	13.24	12.60	6.05	101.1 99.3 98.7 100.3

[a] M5B - Probe and filter heated to 160°C.
M5Bw - Probe and filter heated to 160°C; water rinse of nozzle, probe, and filter holder.
M5B-P400 - Probe heated to 204°C; filter heated to 160°C.

[b] All desired filter temperatures were 160°C.

[c] Sample volume in dry normal cubic meters (dNm^3) at 20°C and 760 mmHg and in dry standard cubic feet (dscf) at 68°F and 29.92 in.Hg.

[d] The sampling nozzles were positioned 65 cm (25.5 in.) from the inside stack wall. For subsequent runs the distance was 81 cm (32 in.).

[e] Ranged from 380° to 397°F.

[f] Ranged from 343° to 351°F.

TABLE 4-2. SUMMARY OF THERMOGRAVIMETRIC ANALYTICAL RESULTS

Test No.	Train I.D.	Sample type	Filterable particulate following conditioning at indicated temperatures, °C (°F), mg							
			Ambient		160°C (320°F)		232°C (450°F)		316°C (600°F)	
			Probe	Filter	Probe	Filter	Probe	Filter	Probe	Filter
1	1A	M5B	21.7	4.2	11.3	2.6	6.8	2.0	5.6	1.3
	1B[a]	M5B	75.8	3.9	14.3	1.7	9.2	1.1	8.1	0.8
	1C[a]	M5BW	-	-	-	-	-	-	-	-
	1D[a]	M5BW	-	-	-	-	-	-	-	-
2	2A[b]	P400	24.9	4.2	14.4	2.8	14.9	2.4	11.8	2.3
	2B[b]	P400	21.1	5.1	8.7	3.9	5.4	3.3	4.3	2.7
	2C	M5B	48.9	7.7	14.3	3.9	16.3	3.1	11.7	2.9
	2D	M5B	29.0	5.3	8.0	3.8	5.6	3.5	3.0	2.4
3	3A[a]	M5BW	-	-	-	-	-	-	-	-
	3B[a]	M5BW	-	-	-	-	-	-	-	-
	3C[b]	M5B	51.0	7.8	-	-	-	-	9.6	3.5
	3D	M5B	61.9	7.7	-	-	-	-	22.2	4.4
4	4A	M5B	20.3	6.4	-	-	7.4	4.7	6.8	4.2
	4B	M5B	19.9	6.8	-	-	-	-	7.1	4.1
	4C	P400	33.2	7.6	-	-	13.3	5.3	11.0	4.8
	4D	P400	20.4	6.8	-	-	-	-	8.6	3.8
5	5A[b]	M5B	40.3	7.3	15.5	5.6	12.4	4.7	9.8	4.9
	5B	M5B	39.0	7.2	11.3	5.0	13.3	4.6	9.7	4.2
	5C[b]	M5B	45.5	8.5	-	-	11.9	5.2	9.0	4.2
	5D	M5B	40.8	7.4	-	-	12.3	4.1	9.3	3.9
6	6A	M5B	25.6	3.0	18.1	6.4	15.4	5.5	12.8	5.0
	6B[a]	M5B	23.3	10.5	14.0	5.5	10.5	5.0	6.9	4.7
	6C[a]	M5BW	-	-	-	-	-	-	-	-
	6D[a]	M5BW	-	-	-	-	-	-	-	-
7	7A[b]	P400	37.0	9.4	20.8	5.7	17.0	5.0	11.0	4.7
	7B	P400	24.6	13.4	12.1	8.4	12.6	6.7	10.7	6.4
	7C[b]	M5B	69.4	10.6	22.4	6.2	17.6	4.8	8.6	5.0
	7D	M5B	75.2	11.1	23.7	7.6	23.4	7.0	20.3	6.2

(continued)

TABLE 4-2 (continued)

Test No.	Train I.D.	Sample type	Filterable particulate following conditioning at indicated temperatures, °C (°F), mg							
			Ambient		160°C (320°F)		232°C (450°F)		316°C (600°F)	
			Probe	Filter	Probe	Filter	Probe	Filter	Probe	Filter
8	8A[a]	M5BW	-	-	-	-	-	-	-	-
	8B[a]	M5BW	-	-	-	-	-	-	-	-
	8C[b]	M5B	79.2	13.1	12.3	6.7	13.5	6.2	10.4	5.1
	8D[b]	M5B	74.4	14.4	15.4	4.3	16.6	1.9	11.0	1.3
9	9A[b]	M5B	45.9	11.2	-	-	-	-	13.5	5.0
	9B[b]	M5B	47.1	11.1	-	-	18.2	7.2	14.0	6.5
	9C[b]	P400	23.4	8.2	-	-	-	-	10.8	4.6
	9D[b]	P400	29.4	9.6	-	-	14.3	5.8	12.7	5.2
10	10A[b]	M5B	27.0	18.0	12.0	13.5	12.1	12.7	9.4	11.8
	10B[b]	M5B	20.9	17.6	13.4	14.3	10.4	11.9	8.0	11.2
	10C	M5B	68.4	17.0	-	-	19.5	10.6	15.9	10.0
	10D	M5B	59.3	18.0	-	-	16.8	12.6	11.8	10.8

[a]M5BW samples were analyzed for total water soluble sulfates and particulate mass by modified Texas Air Board procedure described in Section 3 of this report.

[b]Heated for 24 hours, all others heated for 6 hours.

M5B-P400). All weights are reported in milligrams (mg) and sample concentrations in milligrams per dry normal cubic meter (mg/dNm^3).

The constant weight criteria described in Method 5* were achieved during the ambient weighing on all of the Method 5B and Method 5B-P400 samples; however, several of the probe rinse samples required up to four separate weighings before the criteria were met.

As previously noted, the samples were heat-conditioned at each temperature for either 6 or 24 hours as indicated in the table, and then reheated at the same conditions until a stable weight was achieved prior to advancing to the next temperature in the analytical sequence. The stable weight criteria, which was defined as a difference of 5.0 mg or less between consecutive, similar heat treatments, was achieved for all of the filters and most of the probe rinse samples in two treatments. All of the samples met the criteria in three treatments.

Table 4-3 presents a comparison of total filterable particulate concentrations after heat conditioning at the indicated temperatures for the M5B and M5B-P400 samples. For reporting purposes, the results of similar sample types have been grouped together. The average concentration and standard deviation are given in mg/dNm^3 for all samples of a similar type and temperature. In addition, the number of data points at each temperature

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*40 CFR 60, Appendix A, July 1, 1981.

TABLE 4-3. COMPARISON OF FILTERABLE PARTICULATE CONCENTRATION AFTER CONDITIONING AT INDICATED TEMPERATURES[a]

Run No.	Sample type	Ambient		160°C		232°C		315°C	
		Total weight, mg	Concentration, mg/dNm³	Total weight, mg	Concentration, mg/dNm³	Total weight, mg	Concentration, mg/dNm³	Total weight, mg	Concentration, mg/dNm³
1A	M5B	25.9	12.0	13.9	6.4	8.8	4.1	6.9	3.2
1B	M5B	79.7	37.6	16.0	7.5	10.3	4.9	8.9	4.2
2C[b]	M5B	56.6	28.5	18.2	9.2	19.4	9.8	14.6	7.4
2D	M5B	34.3	17.5	11.8	6.0	9.1	4.6	5.4	2.8
3C[b]	M5B	58.8	18.9	-	-	-	-	13.1	4.2
3D[b]	M5B	69.6	22.0	-	-	-	-	26.6	8.4
4A	M5B	26.7	7.8	-	-	12.1	3.5	11.0	3.2
4B	M5B	26.7	7.9	-	-	-	-	11.2	3.3
5A	M5B	47.6	14.2	21.1	6.3	17.1	5.1	14.7	4.4
5B[b]	M5B	46.2	13.9	16.3	4.9	17.9	5.4	13.9	4.2
5C	M5B	54.0	16.6	-	-	17.1	5.3	13.2	4.1
5D[b]	M5B	48.2	14.8	-	-	16.4	5.0	13.2	4.1
6A	M5B	33.6	10.6	24.5	7.7	20.9	6.6	17.8	5.6
6B	M5B	33.8	10.7	19.5	6.1	15.5	4.9	11.6	3.7
7C	M5B	80.0	25.5	28.6	9.1	22.4	7.2	13.6	4.3
7D[b]	M5B	86.3	26.5	31.3	9.6	30.4	9.3	26.5	8.1
8C[b]	M5B	92.3	29.5	19.0	6.1	19.7	6.3	15.5	5.0
8D[b]	M5B	88.8	27.3	19.7	6.1	18.5	5.7	12.3	3.8
9A[b]	M5B	57.1	17.3	-	-	-	-	18.5	5.6
9B[b]	M5B	58.2	17.8	-	-	25.4	7.8	20.5	6.3
10A[b]	M5B	45.0	13.5	25.5	7.7	24.8	7.5	21.2	6.4
10B	M5B	38.5	11.7	27.7	8.4	22.3	6.8	19.2	5.8
10C[b]	M5B	85.4	26.3	-	-	30.1	9.3	25.9	8.0
10D	M5B	77.3	23.1	-	-	29.4	8.8	22.6	6.7
	Average		18.8		7.2		6.4		5.1
			σ^c = 7.8		σ = 1.4		σ = 1.9		σ = 1.7
			N^d = 24		N = 14		N = 20		N = 24

TABLE 4-3 (continued)

Run No.	Sample type	Ambient		160°C		232°C		315°C	
		Total weight, mg	Concentration, mg/dNm³	Total weight, mg	Concentration, mg/dNm³	Total weight, mg	Concentration, mg/dNm³	Total weight, mg	Concentration, mg/dNm³
2A[b]	M5B-P400	29.1	14.2	17.2	8.4	17.3	8.4	14.1	6.9
2B	M5B-P400	26.2	13.0	12.6	6.3	8.7	4.3	7.0	3.5
4C	M5B-P400	40.8	12.0	-	-	18.6	5.5	15.8	4.7
4D	M5B-P400	27.2	7.9	-	-	-	-	12.4	3.6
7A[b]	M5B-P400	46.4	14.1	26.5	8.0	22.0	6.7	15.7	4.8
7B[b]	M5B-P400	38.0	11.6	20.5	6.3	19.3	5.9	17.1	5.2
9C[b]	M5B-P400	31.6	10.0	-	-	-	-	15.4	4.9
9D[b]	M5B-P400	39.0	12.0	-	-	20.1	6.2	17.9	5.5
Average			11.8 σ = 2.1 N = 8		7.2 σ = 1.1 N = 4		6.2 σ = 1.4 N = 6		4.9 σ = 1.1 N = 8

[a]Includes both filter and probe rinse fractions.

[b]Heat conditioning intervals for these samples were 24 hours; all others were 6 hours.

[c]Standard deviation with N-1 weighting for sample data.

[d]Number of data points.

condition is shown. Figure 4-1 is a graphical representation of the average data.

Table 4-4 presents the statistical data for each set of grouped runs. Each group represents two runs of the same sample type conducted at the same time except for run Groups 5 and 10, which represent four similar samples. The M5B data are followed by the M5B-P400 data. Presented for each run group and temperature condition are the mean filterable particulate concentration, the standard deviation with N-1 weighting for sample data, and the percent coefficient of variation (CV), which expresses the standard deviation as a percent of the mean concentration.

Table 4-5 summarizes the estimates of precision for Method 5B and Method 5B-P400 at each conditioning temperature. Method 5B precision data are presented on two bases; the first includes all available data (Runs 1 through 10), and the second includes only data from Runs 2, 4, 7, and 9 to allow a better comparison to within-run M5B-P400 data. The mean filterable concentrations were calculated by averaging the individual run data to minimize round-off error. The mean standard deviations were calculated by averaging standard deviation values for each set of grouped runs (from Table 4-4) to minimize the effect of temporal variation in emissions. In this way, the mean standard deviation of the grouped runs ($\bar{\sigma}$ in Table 4-5) more accurately reflects method precision than does the standard deviation of individual run concentrations (σ in Table 4-3). The mean coefficient of variation expresses the mean standard deviation as a percent of the

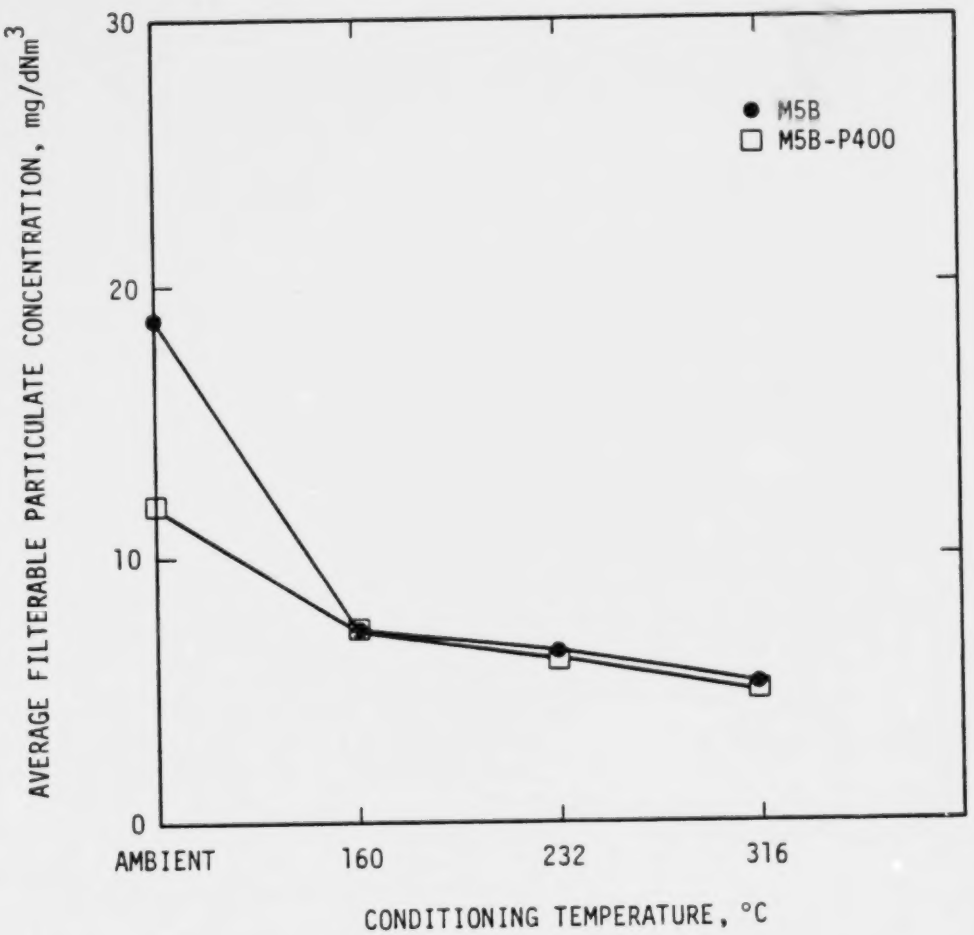

Figure 4-1. Average filterable particulate concentration for similar sample types after conditioning at indicated temperature.

TABLE 4-4. STATISTICAL DATA FOR GROUPED RUNS AFTER CONDITIONING AT INDICATED TEMPERATURES

Run No.	Sample type	Ambient			160°C (320°F)			232°C (450°F)			316°C (600°F)		
		$\bar{x}$,[a] mg/dNm³	σ,[b] mg/dNm³	CV,[c] %	$\bar{x}$, mg/dNm³	σ, mg/dNm³	CV, %	$\bar{x}$, mg/dNm³	σ, mg/dNm³	CV, %	$\bar{x}$, mg/dNm³	σ, mg/dNm³	CV, %
1-A,B	M5B	24.8	18.1	73	7.0	0.8	11	4.5	0.6	13	3.7	0.7	19
2-C[d],D	M5B	23.0	7.8	34	7.6	2.3	30	7.2	3.7	51	5.1	3.3	65
3-C,D[d]	M5B	20.4	2.2	11	-	-	-	-	-	-	6.3	3.0	48
4-A,B	M5B	7.8	0.1	1	-	-	-	3.5[e]	-	-	3.2	0.1	3
5-A,B[d], C,D[d]	M5B	14.9	1.2	8	5.6[f]	1.0	18	5.2	0.2	4	4.2	0.1	2
6-A,B	M5B	10.6	0.1	1	6.9	1.1	16	5.8	1.2	21	4.6	1.3	28
7-C,D[d]	M5B	26.0	0.7	3	9.4	0.4	4	8.2	1.5	18	6.2	2.7	44
8-C[d],D[d]	M5B	28.4	1.6	6	6.1	0.0	0	6.0	0.4	7	4.4	0.8	18
9-A[d],B[d]	M5B	17.6	0.4	2	-	-	-	7.8[e]	-	-	6.0	0.5	8
10-A[d],B, C[d],D	M5B	18.6	7.1	38	8.0[f]	0.5	6	8.1	1.2	15	6.7	0.9	13
2-A[d],B	M5B-P400	13.6	0.8	6	7.4	1.5	20	6.4	2.9	45	5.2	2.4	46
4-C,D	M5B-P400	10.0	2.9	29	-	-	-	5.5[e]	-	-	4.2	0.8	19

TABLE 4-4 (continued)

Run No.	Sample type	Ambient			160°C (320°F)			232°C (450°F)			316°C (600°F)		
		$\bar{x}$,[a] mg/dNm³	σ,[b] mg/dNm³	CV,[c] %	$\bar{x}$, mg/dNm³	σ, mg/dNm³	CV, %	$\bar{x}$, mg/dNm³	σ, mg/dNm³	CV, %	$\bar{x}$, mg/dNm³	σ, mg/dNm³	CV, %
7-A,B[d]	M5B-P400	12.8	1.8	14	7.2	1.2	17	6.3	0.6	10	5.0	0.3	6
9-C[d],D[d]	M5B-P400	11.0	1.4	13	-	-	-	6.2[e]	-	-	5.2	0.4	8

[a]Mean filterable concentration.

[b]Within-run standard deviation with N-1 weighting for sample data.

[c]Coefficient of variance is the standard deviation expressed as a percent of the mean concentration.

[d]Samples heated for 24-hour intervals; all others heated 6 hours.

[e]One sample only.

[f]Two samples only.

TABLE 4-5. SUMMARY OF PRECISION ESTIMATES AFTER CONDITIONING AT INDICATED TEMPERATURES

Run No.	Sample type	Ambient			160°C (320°F)			232°C (450°F)			316°C (600°F)		
		$\bar{x}$,[a] mg/dNm³	$\bar{\sigma}$,[b] mg/dNm³	$\overline{CV}$,[c] %	$\bar{x}$, mg/dNm³	$\bar{\sigma}$, mg/dNm³	$\overline{CV}$, %	$\bar{x}$, mg/dNm³	$\bar{\sigma}$, mg/dNm³	$\overline{CV}$, %	$\bar{x}$, mg/dNm³	$\bar{\sigma}$, mg/dNm³	$\overline{CV}$, %
1-10	M5B	18.8	3.9	21	7.2	0.9	12	6.4	1.3	20	5.1	1.3	25
		N[d] = 24	N = 10	-	N = 14	N = 7	-	N = 20	N = 7	-	N = 24	N = 10	-
2,4, 7,9	M5B	18.6	2.2	12	8.5	1.4	16	7.0	2.6	37	5.1	1.6	31
		N = 8	N = 4	-	N = 4	N = 2	-	N = 6	N = 2	-	N = 8	N = 4	-
2,4 7,9	M5B-P400	11.8	1.7	14	7.2	1.4	19	6.2	1.8	29	4.9	1.0	20
		N = 8	N = 4	-	N = 4	N = 2	-	N = 6	N = 2	-	N = 8	N = 4	-

[a] Mean filterable concentration based on individual run values.

[b] Mean standard deviation of grouped runs ($\frac{\Sigma\sigma i}{N}$).

[c] Mean coefficient of variance (percent) calculated using the mean standard deviation of grouped runs and the mean filterable concentration based on individual run values.

[d] N = number of data points.

mean concentration. The number of data points included in each calculation is shown for consideration in evaluating the precision estimates.

Table 4-6 presents the relative percent weight loss for the filter samples after conditioning at the indicated temperatures. Percent weight loss was calculated in two ways; first, using the ambient weight as the initial weight basis, and secondly, using the weight after conditioning at 160°C (320°F) as the initial weight basis. The results of similar sample types have been grouped together. Tables 4-7 and 4-8 present similar data for the probe rinse samples and the total filterable samples, respectively. Figure 4-2 is a graphical representation of the average weight loss data on an ambient weight basis. The graph points out two characteristics of the tabulated data: 1) the most significant weight loss occurred during heating at 160°C (320°F), and 2) the relative percent weight loss upon subsequent heating at temperatures higher than 160°C was similar for all samples (note that the curves are essentially parallel between 160° and 316°C).

Table 4-9 presents data used to evaluate the effect of heat conditioning time on weight loss. Raw laboratory data for each filter sample were examined to determine the weight loss between the first and second heat treatment at a given conditioning temperature. These weight losses are tabulated by sample type and heating time. The filter sample results appear to favor the 24-hour heating interval (note the 6-h results for Runs 6B and 7C

TABLE 4-6. RELATIVE PERCENT WEIGHT LOSS FOR FILTER SAMPLES AFTER CONDITIONING AT INDICATED TEMPERATURES

Run No.	Sample type	Net filter weights, mg				Relative weight loss[a], %				
						From ambient to:			From 160°C to:	
		Amb.	160°C	232°C	316°C	160°C	232°C	316°C	232°C	316°C
1A	M5B	4.2	2.6	2.0	1.3	38	52	69	23	50
1B	M5B	3.9	1.7	1.1	0.8	56	72	79	35	53
2C[b]	M5B	7.7	3.9	3.1	2.9	49	60	62	21	26
2D	M5B	5.3	3.8	3.5	2.4	28	34	55	8	37
3C[b]	M5B	7.8	-	-	3.5	-	-	55	-	-
3D[b]	M5B	7.7	-	-	4.4	-	-	43	-	-
4A	M5B	6.4	-	4.7	4.2	-	27	34	-	-
4B	M5B	6.8	-	-	4.1	-	-	40	-	-
5A[b]	M5B	7.3	5.6	4.7	4.9	23	36	33	16	12
5B[b]	M5B	7.2	5.0	4.6	4.2	31	36	42	8	16
5C[b]	M5B	8.5	-	5.2	4.2	-	39	51	-	-
5D[b]	M5B	7.4	-	4.1	3.9	-	45	47	-	-
6A	M5B	8.0	6.4	5.5	5.0	20	31	38	14	22
6B	M5B	10.5	5.5	5.0	4.7	48	52	55	9	15
7C[b]	M5B	10.6	6.2	4.8	5.0	42	55	53	23	19
7D[b]	M5B	11.1	7.6	7.0	6.2	32	37	44	8	18
8C[b]	M5B	13.1	6.7	6.2	5.1	49	53	61	7	24
8D[b]	M5B	14.4	4.3	1.9	1.3	70	87	91	56	70
9A[b]	M5B	11.2	-	-	5.0	-	-	55	-	-
9B[b]	M5B	11.1	-	7.2	6.5	-	35	41	-	-

(continued)

TABLE 4-6 (continued)

Run No.	Sample type	Net filter weights, mg				Relative weight loss[a], %				
						From ambient to:			From 160°C to:	
		Amb.	160°C	232°C	316°C	160°C	232°C	316°C	232°C	316°C
10A[b]	M5B	18.0	13.5	12.7	11.8	25	29	34	6	13
10B[b]	M5B	17.6	14.3	11.9	11.2	19	32	36	17	22
10C[b]	M5B	17.0	-	10.6	10.0	-	38	41	-	-
10D	M5B	18.0	-	12.6	10.8	-	30	40	-	-
M5B average						38	44	50	18	28
2A[b]	M5B-P400	4.2	2.8	2.4	2.3	33	43	45	14	18
2B	M5B-P400	5.1	3.9	3.3	2.7	24	35	47	15	31
4C	M5B-P400	7.6	-	5.3	4.8	-	30	37	-	-
4D	M5B-P400	6.8	-	-	3.8	-	-	44	-	-
7A[b]	M5B-P400	9.4	5.7	5.0	4.7	39	47	50	12	18
7B[b]	M5B-P400	13.4	8.4	6.7	6.4	37	50	52	20	24
9C[b]	M5B-P400	8.2	-	-	4.6	-	-	44	-	-
9D[b]	M5B-P400	9.6	-	5.8	5.2	-	40	46	-	-
M5B-P400 average						33	41	46	15	23

[a]Weight loss, % = $\frac{\text{Weight @ } T_1 - \text{Weight @ } T_2}{\text{Weight @ } T_1} \times 100$; where $T_1 < T_2$.

[b]Heat conditioning intervals for these samples were 24 hours; others were 6 hours.

TABLE 4-7. RELATIVE PERCENT WEIGHT LOSS FOR PROBE RINSE SAMPLES AFTER CONDITIONING AT INDICATED TEMPERATURES

Run No.	Sample type	Net probe rinse weights, mg				Relative weight loss[a], %				
						From ambient to:			From 160°C to:	
		Amb.	160°C	232°C	316°C	160°C	232°C	316°C	232°C	316°C
1A	M5B	21.7	11.3	6.8	5.6	48	69	74	40	50
1B	M5B	75.8	14.3	9.2	8.1	81	88	89	36	43
2C[b]	M5B	48.9	14.3	16.3	11.7	71	67	76	-14	18
2D	M5B	29.0	8.0	5.6	3.0	72	81	90	30	62
3C	M5B	51.0	-	-	9.6	-	-	81	-	-
3D[b]	M5B	61.9	-	-	22.2	-	-	64	-	-
4A	M5B	20.3	-	7.4	6.8	-	64	67	-	-
4B	M5B	19.9	-	-	7.1	-	-	64	-	-
5A	M5B	40.3	15.5	12.4	9.8	62	69	76	20	37
5B[b]	M5B	39.0	11.3	13.3	9.7	71	66	75	-18	14
5C	M5B	45.5	-	11.9	9.0	-	74	80	-	-
5D[b]	M5B	40.8	-	12.3	9.3	-	70	77	-	-
6A	M5B	25.6	18.1	15.4	12.8	29	40	50	15	29
6B	M5B	23.3	14.0	10.5	6.9	40	55	70	25	51
7C	M5B	69.4	22.4	17.6	8.6	68	75	88	21	62
7D[b]	M5B	75.2	23.7	23.4	20.3	68	69	73	1	14
8C[b]	M5B	79.2	12.3	13.5	10.4	84	83	87	-10	15
8D[b]	M5B	74.4	15.4	16.6	11.0	79	78	85	-8	29
9A[b]	M5B	45.9	-	-	13.5	-	-	71	-	-
9B[b]	M5B	47.1	-	18.2	14.0	-	61	70	-	-

(continued)

TABLE 4-7 (continued)

Run No.	Sample type	Net probe rinse weights, mg				Relative weight loss[a], %				
						From ambient to:			From 160°C to:	
		Amb.	160°C	232°C	316°C	160°C	232°C	316°C	232°C	316°C
10A[b]	M5B	27.0	12.0	12.1	9.4	56	55	65	-1	22
10B[b]	M5B	20.9	13.4	10.4	8.0	36	50	62	22	40
10C	M5B	68.4	-	19.5	15.9	-	71	77	-	-
10D	M5B	59.3	-	16.8	11.8	-	72	80	-	-
M5B average						62	68	75	11	35
2A[b]	M5B-P400	24.9	14.4	14.9	11.8	42	40	53	-3	18
2B	M5B-P400	21.1	8.7	5.4	4.3	59	74	80	38	51
4C	M5B-P400	33.2	-	13.3	11.0	-	60	67	-	-
4D	M5B-P400	20.4	-	-	8.6	-	-	58	-	-
7A[b]	M5B-P400	37.0	20.8	17.0	11.0	44	54	70	18	47
7B[b]	M5B-P400	24.6	12.1	12.6	10.7	51	49	57	-4	12
9C[b]	M5B-P400	23.4	-	-	10.8	-	-	54	-	-
9D[b]	M5B-P400	29.4	-	14.3	12.7	-	51	57	-	-
M5B-P400 average						49	55	62	12	32

[a]Weight loss, % = $\frac{\text{Weight @ } T_1 - \text{Weight @ } T_2}{\text{Weight @ } T_1} \times 100$; where $T_1 < T_2$.

[b]Heat conditioning intervals for these samples were 24 hours; others were 6 hours.

TABLE 4-8. RELATIVE PERCENT WEIGHT LOSS FOR TOTAL FILTERABLE PARTICULATE SAMPLES AFTER CONDITIONING AT INDICATED TEMPERATURES

Run No.	Sample type	Total net weights, mg				Relative weight loss[a], %				
						From ambient to:			From 160°C to:	
		Amb.	160°C	232°C	316°C	160°C	232°C	316°C	232°C	316°C
1A	M5B	25.9	13.9	8.8	6.9	46	66	73	37	50
1B	M5B	79.7	16.0	10.3	8.9	80	87	89	36	44
2C[b]	M5B	56.6	18.2	19.4	14.6	68	66	74	-7	20
2D	M5B	34.3	11.8	9.1	5.4	66	73	84	23	54
3C[b]	M5B	58.8	-	-	13.1	-	-	78	-	-
3D[b]	M5B	69.6	-	-	26.6	-	-	62	-	-
4A	M5B	26.7	-	12.1	11.0	-	55	59	-	-
4B	M5B	26.7	-	-	11.2	-	-	58	-	-
5A[b]	M5B	47.6	21.1	17.1	14.7	56	64	69	19	30
5B[b]	M5B	46.2	16.3	17.9	13.9	65	61	70	-10	15
5C[b]	M5B	54.0	-	17.1	13.2	-	68	76	-	-
5D[b]	M5B	48.2	-	16.4	13.2	-	66	73	-	-
6A	M5B	33.6	24.5	20.9	17.8	27	38	47	15	27
6B	M5B	33.8	19.5	15.5	11.6	42	54	66	21	41
7C[b]	M5B	80.0	28.6	22.4	13.6	64	72	83	22	52
7D[b]	M5B	86.3	31.3	30.4	26.5	64	65	69	3	15
8C[b]	M5B	92.3	19.0	19.7	15.5	79	79	83	-4	18
8D[b]	M5B	88.8	19.7	18.5	12.3	78	79	86	6	38
9A[b]	M5B	57.1	-	-	18.5	-	-	68	-	-
9B[b]	M5B	58.2	-	25.4	20.5	-	56	65	-	-

(continued)

TABLE 4-8 (continued)

Run No.	Sample type	Total net weights, mg				Relative weight loss[a], %				
						From ambient to:			From 160°C to:	
		Amb.	160°C	232°C	316°C	160°C	232°C	316°C	232°C	316°C
10A[b]	M5B	45.0	25.5	24.8	21.2	43	45	53	3	17
10B[b]	M5B	38.5	27.7	22.3	19.2	28	42	50	19	31
10C[b]	M5B	85.4	-	30.1	25.9	-	65	70	-	-
10D	M5B	77.3	-	29.4	22.6	-	62	71	-	-
M5B average						58	63	70	13	32
2A[b]	M5B-P400	29.1	17.2	17.3	14.1	41	41	52	-1	18
2B	M5B-P400	26.2	12.6	8.7	7.0	52	67	73	31	44
4C	M5B-P400	40.8	-	18.6	15.8	-	54	61	-	-
4D	M5B-P400	27.2	-	-	12.4	-	-	54	-	-
7A[b]	M5B-P400	46.4	26.5	22.0	15.7	43	53	66	17	41
7B[b]	M5B-P400	38.0	20.5	19.3	17.1	46	49	55	6	17
9C[b]	M5B-P400	31.6	-	-	15.4	-	-	51	-	-
9D[b]	M5B-P400	39.0	-	20.1	17.9	-	48	54	-	-
M5B-P400 average						46	52	58	13	30

[a]Weight loss, % = $\frac{\text{Weight @ } T_1 - \text{Weight @ } T_2}{\text{Weight @ } T_1} \times 100$; where $T_1 < T_2$.

[b]Heat conditioning intervals for these samples were 24 hours; others were 6 hours.

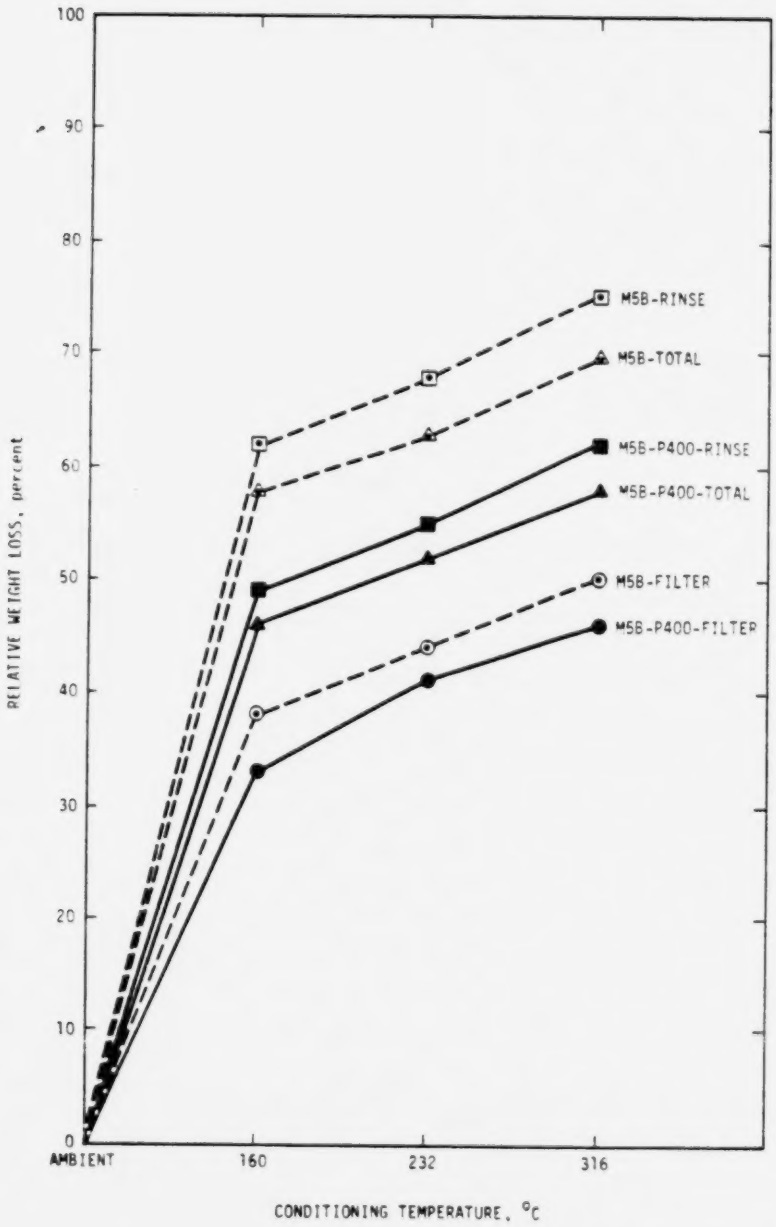

Figure 4-2. Average relative percent weight loss after conditioning at indicated temperatures - ambient weight basis.

TABLE 4-9. EFFECT OF HEAT CONDITIONING TIME ON WEIGHT LOSS OF FILTER SAMPLES

Run No.	Sample type	Heating time per treatment, h	Weight loss between heat treatments at indicated temperatures[a], mg		
			160°C (320°F) 1st-2nd Treatment	232°C (450°F) 1st-2nd Treatment	316°C (600°F) 1st-2nd Treatment
1A	M5B	6	0.3	0.4	0.2
1B	M5B	6	0.1	0.0	0.0
2D	M5B	6	-0.2	0.3	0.4
3C	M5B	6	-	-	0.2
4A	M5B	6	-	0.2	0.1
4B	M5B	6	-	-	0.0
5A	M5B	6	0.0	0.3	0.1
5C	M5B	6	-	0.3	0.3
6A	M5B	6	0.3	0.4	0.2
6B	M5B	6	2.7[b]	0.2	0.2
7C	M5B	6	1.8[c]	0.5	-0.1
10B	M5B	6	0.4	0.0	0.0
10D	M5B	6	-	0.2	0.5
Average			0.7[d]	0.3	0.2
2C	M5B	24	-0.7[e]	-0.2	0.2
3D	M5B	24	-	-	0.0
5B	M5B	24	0.1	-0.1	0.3
5D	M5B	24	-	0.4	0.4
7D	M5B	24	0.4	0.0	0.2
8C	M5B	24	0.1	1.0[f]	0.4
8D	M5B	24	0.1	0.1	0.0
9A	M5B	24	-	-	-0.1
9B	M5B	24	-	0.3	0.2
10A	M5B	24	0.4	0.0	0.0
10C	M5B	24	-	0.5	0.3
Average			0.1	0.2	0.2
2B	M5B-P400	6	0.2	0.0	0.3
4C	M5B-P400	6	-	0.2	0.3
4D	M5B-P400	6	-	-	0.3
7A	M5B-P400	6	0.2	0.2	0.2
Average			0.2	0.1	0.3

(continued)

TABLE 4-9 (continued)

Run No.	Sample type	Heating time per treatment, h	Weight loss between heat treatments at indicated temperatures[a], mg		
			160°C (320°F) 1st-2nd Treatment	232°C (450°F) 1st-2nd Treatment	316°C (600°F) 1st-2nd Treatment
2A	M5B-P400	24	0.1[g]	0.1	0.2
7B	M5B-P400	24	1.4	0.2	-0.1
9C	M5B-P400	24	-	-	-0.2
9D	M5B-P400	24	-	0.3	0.3
Average			0.8	0.2	0.1

[a]Weight loss between individual weighings from raw lab data sheets.

[b]No additional weight loss was observed after a third heat treatment.

[c]An additional loss of 0.1 mg was observed after a third heat treatment.

[d]Similar probe rinse samples heated for 6 hours had an average weight loss between treatments of 0.3 mg. All differences were less than 0.5 mg.

[e]An additional loss of 0.2 mg was observed after a third heat treatment.

[f]This sample did not show any weight loss on first heating at this temperature.

[g]An additional loss of 1.6 mg was observed after a third heat treatment.

at 160°C), but this is tempered by the results of Run 8C at 232°C and Run 7B at 160°C. Data for probe rinse samples were examined in a similar manner. All of the probe rinse samples heated for 6-h intervals had a weight loss of less than 0.5 mg between the first and second treatments at 160°C. In total, these results do not indicate a clear advantage of using a 24-h interval over a 6-h interval, in that two heat treatments at the same temperature were required regardless of duration to assure weight stability.

Selected samples that had been heat-conditioned to 316°C (600°F) were heated to 400°C (752°F) to determine if any additional weight loss would occur. Table 4-10 presents the net sample weights after heat conditioning and the observed weight loss. Very little additional weight was lost on an average basis, although there was a high degree of variability among individual samples.

4.3 WATER-SOLUBLE SULFATE ANALYTICAL DATA

Table 4-11 summarizes the nonwater-soluble sulfate particulate (NWSSP) results of the Method 5BW tests. Since particulate matter cannot be determined gravimetrically in the presence of sulfuric acid due to the inexact amount of water retained by the acid, the method is designed to convert the acid to a non-hygroscopic, non-volatile product, in this case ammonium sulfate. The acid is measured as water-soluble sulfate and converted to ammonium sulfate. The weight of ammonium sulfate formed is subtracted from the total weight of ammonium sulfate and NWSSP

TABLE 4-10. ADDITIONAL WEIGHT LOSS AFTER HEATING TO 400°C

Run No.	Sample type	Net filterable particulate remaining after heat-conditioning to 400°C, mg		Weight loss observed between heating from 316°C to 400°C, mg	
		Probe rinse	Filter	Probe rinse	Filter
4A	M5B	5.0	4.0	1.8	0.2
4B	M5B	7.7	3.8	-0.6[a]	0.3
5B	M5B	8.7	4.0	1.0	0.2
5C	M5B	6.8	3.5	2.2	0.7
5D	M5B	5.8	3.8	3.5	0.1
7C	M5B	8.5	3.9	0.1	1.1
9A	M5B	13.9	4.4	0.4	0.6
10A	M5B	10.0	10.6	-0.6	1.2
10B	M5B	9.8	9.8	-1.8	1.4
10D	M5B	13.0	9.8	-1.2	1.0
Average		8.9	5.8	0.5	0.7
4D	M5B-P400	8.8	3.7	-0.2	0.1
7A	M5B-P400	11.4	4.2	-0.4	0.5
7B	M5B-P400	9.5	4.9	1.2	1.5
9C	M5B-P400	10.9	4.3	0.1	0.3
9D	M5B-P400	13.2	4.8	-0.5	0.4
Average		10.8	4.4	0.0	0.6

[a]Negative sign indicates a weight gain.

TABLE 4-11. SUMMARY OF NONWATER-SOLUBLE SULFATE PARTICULATE RESULTS[a]

Run No.	Weight, mg			Total filterable concentration, mg/dNm³	M5B Run No.	Comparison to within-run samples after heating to indicated temperature: Filterable concentration, mg/dNm³	
	Filter	Probe rinse	Total			232°C	316°C
1C	1.6	9.6	11.2	5.4	1A	4.1	3.2
1D	0.1	5.2	5.3	2.5	1B	4.9	4.2
3A	2.2	21.8	24.0	7.4	3C	-	4.2
3B	3.7	6.5	10.2	3.2	3D	-	8.4
6C	3.7	14.8	18.5	5.9	6A	6.6	5.6
6D	2.1	11.0	13.1	4.1	6B	4.9	3.7
8A	3.0	18.0	21.0	6.6	8C	6.3	5.0
8B	2.8	16.0	18.8	6.0	8D	5.7	3.8
			Average =	5.1		Average = 5.4	4.8
			σ =	1.7		σ = 1.0	1.7
			N =	8		N = 6	8

[a]NWSSP results of the Method 5BW tests using Texas Air Board procedures modified by the use of ion chromatography to measure sulfate concentrations.

(particulate excluding water-soluble sulfates). Results of within-run Method 5B samples are presented for comparison.

As shown in Table 4-11, the average Method 5BW results fell between the Method 5B samples that had been heated to 232°C (450°F) and 316°C (600°F). Method precisions were comparable. The fact that the filterable concentration of samples heat-conditioned to 316°C was lower than the NWSSP concentration may indicate that a small quantity of volatile material other than water-soluble sulfate was eliminated by thermal conditioning. Because of the low absolute magnitude of these concentrations [approximately 5 mg/dNm³ (0.002 gr/dscf)], however, the apparent difference may be considered statistically insignificant (note the standard deviation values).

Table 4-12 presents the results of selected Method 5B samples heat-conditioned to 316°C that were extracted with water and analyzed for sulfate by IC. Shown for each sample fraction are the net filterable particulate weights after conditioning at 316°C and the weight of sulfate ($SO_4^=$) found in that sample. Filter $SO_4^=$ results were adjusted for a blank weight of 0.8 mg. The amount of $SO_4^=$ detected represents a significant portion of the particulate remaining after heat-conditioning, especially for the filter samples that apparently contain nothing but sulfates. Again, because of the low absolute magnitude of sample weights, the $SO_4^=$ results may not be as significant as they seem to be. Because the emission source had a limestone scrubber, calcium is the cation most likely associated with any residual water-soluble sulfate.

TABLE 4-12. WATER-SOLUBLE SULFATE DETECTED IN SAMPLES HEAT-CONDITIONED TO 316°C

Run No.	Sample type	Net filterable particulate remaining after heat-conditioning to 316°C, mg		Weight of $SO_4^=$ in sample, mg	
		Probe rinse	Filter	Probe rinse	Filter[a]
1A	M5B	5.6	1.3	4.7	1.1
1B	M5B	8.1	0.8	3.3	3.4
2C	M5B	11.7	2.9	3.7	2.0
2D	M5B	3.0	2.4	1.9	1.8
3C	M5B	9.6	3.5	4.9	2.5
3D	M5B	22.2	4.4	8.0	2.1
5A	M5B	9.8	4.9	4.1	2.0
6A	M5B	12.8	5.0	4.8	2.2
6B	M5B	6.9	4.7	2.5	2.7
7D	M5B	20.3	6.2	7.9	2.8
8C	M5B	10.4	5.1	3.7	3.2
8D	M5B	11.0	1.3	4.8	2.3
9B	M5B	14.0	6.5	5.0	2.5
10C	M5B	15.9	10.0	6.3	3.8
Average		11.5	4.2	4.7	2.5
2A	M5B-P400	11.8	2.3	2.5	1.7
2B	M5B-P400	4.3	2.7	1.7	1.8
4C	M5B-P400	11.0	4.8	3.0	2.4
Average		9.0	3.3	2.4	2.0

[a]Adjusted for a blank weight of 0.8 mg.

4.4 METHOD 8 ANALYTICAL RESULTS

Table 4-13 presents the results of back-half analyses for sulfates as H_2SO_4 and SO_2. As expected, the H_2SO_4 data show a high degree of variability. Results for Runs 4 and 7 support the filterable particulate data relative to the effect that a higher sampling temperature can minimize retention of sulfate in the front half of a sample train. The SO_2 data show a high degree of precision.

TABLE 4-13. SUMMARY OF BACK-HALF ANALYSES

Test No.	Train I.D.	Sample type	H_2SO_4[a]		SO_2[b]	
			mg	mg/dNm³	mg	mg/dNm³
1	1A	M5B	18.3	8.47	1910	884
	1B	M5B	49.5	23.3	2020	952
	1C	M5BW	107	51.4	1970	946
	1D	M5BW	6.9	3.32	1990	957
2	2A	M5B-P400	33.9	16.5	1870	910
	2B	M5B-P400	81.8	40.6	2310	1150
	2C	M5B	190	95.7	2260	1140
	2D	M5B	81.7	41.6	2370	1210
3	3A	M5BW	78.5	24.4	4090	1270
	3B	M5BW	64.9	20.4	4080	1280
	3C	M5B	104	33.4	3970	1270
	3D	M5B	71.7	22.7	4080	1290
4	4A	M5B	28.3	8.23	4350	1260
	4B	M5B	98.5	29.0	4360	1280
	4C	M5B-P400	107	31.6	4380	1290
	4D	M5B-P400	105	30.4	4340	1260
5	5A	M5B	73.8	22.1	4540	1360
	5B	M5B	84.4	25.3	4420	1330
	5C	M5B	134	41.2	4420	1360
	5D	M5B	74.0	22.8	4400	1350
6	6A	M5B	74.3	23.4	3950	1240
	6B	M5B	114	35.9	3910	1230
	6C	M5BW	44.9	14.3	3900	1240
	6D	M5BW	82.4	25.7	4050	1260
7	7A	M5B-P400	110	33.4	4230	1280
	7B	M5B-P400	118	36.0	4240	1290
	7C	M5B	67.3	21.5	4070	1300
	7D	M5B	78.4	24.0	4210	1290

(continued)

TABLE 4-13 (continued)

Test No.	Train I.D.	Sample type	H_2SO_4[a]		SO_2[b]	
			mg	mg/dNm³	mg	mg/dNm³
8	8A	M5BW	87.7	27.4	4070	1270
	8B	M5BW	120	38.0	330	104[c]
	8C	M5B	58.6	18.8	3440	1100
	8D	M5B	62.6	19.3	3960	1220
9	9A	M5B	87.8	26.6	4310	1310
	9B	M5B	101	31.0	4270	1310
	9C	M5B-P400	98.8	31.1	4170	1310
	9D	M5B-P400	85.6	26.3	4290	1320
10	10A	M5B	92.0	27.7	4300	1290
	10B	M5B	104	31.5	4210	1280
	10C	M5B	75.8	23.4	4190	1290
	10D	M5B	58.6	17.5	4340	1290

[a]Sulfate analyses (as H_2SO_4) per Method 8 (40 CFR 60, Appendix A , July 1, 1981) of IPA impinger contents, back-half filter, and rinse.

[b]SO_2 analysis per Method 8 of peroxide impinger contents and rinse.

[c]Outlier.

SECTION 5

DISCUSSION OF TEST RESULTS

The data support previous studies that characterize condensible sulfate bias of particulate measurements at source emission streams containing sulfur oxides.[2,4,5,6] It is evident that sample temperature is a parameter that significantly affects the retention of condensible material in the front half of the standard Method 5 sample train. In this case, condensible matter is defined as probe rinse/filter residue that can be removed by heating. Sulfate species will most likely exist in sources containing sulfur oxides. Water-soluble sulfate can exist in these sources in many different chemical forms. Sulfuric acid (H_2SO_4) is the most common form, but salts of ammonium, sodium, or other cations are also possible. Because exit gas streams from boilers are known to contain sulfur trioxide and sulfur dioxide, sulfuric acid is the most probable form of water-soluble sulfate.

Data presented in Tables 4-2 and 4-3 show the effects of sample temperature on the measurement of particulate emissions from this source. As expected, the M5B samples collected at 160°C (320°F) showed a slightly higher particulate catch in the probe rinse than the M5B-P400 samples that were collected at a

probe temperature of 204°C (400°F) and a filter temperature of 160°C. The M5B filterable particulate concentration averaged 18.8 mg/dNm³ at ambient conditions compared with the M5B-P400 average of 11.8 mg/dNm³.

Effects of analytical temperature are shown graphically in Figure 4-1. The average M5B and M5B-P400 particulate concentrations are essentially identical at each of the three stages of heat conditioning from 160°C (320°F) through 316°C (600°F). The M5B sample concentrations averaged 7.2, 6.4, and 5.1 mg/dNm³ after conditioning at 160°, 232°, and 316°C, respectively. Corresponding results of the M5B-P400 runs at the three temperatures were 7.2, 6.2, and 4.9 mg/dNm³.

A closer examination of within-run samples (as presented in Table 4-5) shows a larger difference between the two methods until the samples were heated at 316°C. For Runs 2, 4, 7, and 9, the M5B sample concentrations averaged 8.5, 7.0, and 5.1 mg/dNm³ after conditioning at the three temperature stages. Corresponding results of the M5B-P400 runs at the three temperatures were 7.2, 6.2, and 4.9 mg/dNm³. This apparent difference is probably related more to the small number of data for comparison and to the low absolute magnitude of results rather than to any factor of significance.

Weight loss data presented in Tables 4-6 through 4-8 and Figure 4-2 show that both probe rinse and filter samples of each method type lost significant percentages of their ambient weights upon heating, although there was a high degree of variability

among individual samples. The M5B and M5B-P400 filter samples had average weight losses of 50 and 46 percent after thermal treatment at 316°C. This close comparison was expected because the sample filtration temperatures were both 160°C. The apparent high degree of weight loss is deceiving due to the low sample weights; that is, a 50 percent weight loss corresponds to approximately 5 mg.

The M5B and M5B-P400 probe rinse samples had average weight losses of 75 and 62 percent after thermal treatment at 316°C. These percentages correspond to approximately 30 and 15 mg, respectively.

As shown in Figure 4-2, most of the sample weight loss occurred during heat treatment at 160°C (320°F). During subsequent heat treatments up to a temperature of 316°C (600°F), the M5B and M5B-P400 filter samples had an average weight loss of only 28 and 23 percent, respectively. Similarly, the M5B and M5B-P400 probe rinse samples had subsequent average weight losses of 35 and 32 percent, respectively.

The data in Table 4-10 indicate that very little additional weight loss occurred between heat conditioning at 316°C and 400°C; in fact, several samples showed slight weight gains. The small weight differences observed are probably related to the low magnitude of net weights.

The data in Table 4-9 show the effect of heat conditioning time on weight loss. Although the data suggest that in most cases one 6-h heating interval was sufficient to remove material

volatile at a given temperature, it may not be the case for other emission sources or for larger sample catch weights.

Statistical data for grouped runs in Tables 4-4 and 4-5 show the precision estimates for Methods 5B and M5B-P400. For a given group of two or four runs, the within-run agreement was expected to improve after each stage of heat treatment due to further elimination of sulfate biases. Generally, the observed precision was better after heating at 160°C, and for several samples, after heating at subsequent temperatures. The precision worsened in some cases, however, probably as a result of increased sample handling or because of the low absolute magnitude of net sample weights.

The mean standard deviation for all 10 M5B run groups was 3.9 mg/dNm^3 at ambient conditions, which corresponds to a coefficient of variation (CV) of 21 percent. Seven of the 10 groups had a standard deviation equal to 2.2 mg/dNm^3 or less, which corresponds to a CV of 11 percent or less. The four M5B-P400 run groups had a mean standard deviation of 1.7 mg/dNm^3 and a corresponding CV of 14 percent at ambient conditions. The enhanced precision of the M5B-P400 run groups at ambient conditions was expected due to the reduced bias of condensible sulfates in the probe rinse samples.

The mean standard deviation for the seven M5B run groups heated to 160°C (320°F) was 0.9 mg/dNm^3 with a corresponding CV of 12 percent, which indicated a significant improvement over results at ambient conditions. For the two M5B-P400 run groups

heated to 160°C, the mean standard deviation and CV were 1.4 mg/dNm³ and 19 percent, respectively.

Precision data for the seven M5B run groups heated to 232°C (450°F) included a mean standard deviation of 1.3 mg/dNm³ and a CV of 20 percent. For the two M5B-P400 run groups, the average standard deviation and CV were 1.8 mg/dNm³ and 29 percent, respectively.

Precision data for the 10 M5B groups heated to 316°C (600°F) included a mean standard deviation of 1.3 mg/dNm³ and a CV of 25 percent. Seven of the 10 run groups had a mean standard deviation of 0.6 mg/dNm³ and a corresponding CV of 13 percent. For the four M5B-P400 samples, the mean standard deviation and CV were 1.0 mg/dNm³ and 20 percent, respectively. Three of the four M5B-P400 runs, however, had a mean standard deviation of 0.5 mg/dNm³ and a corresponding CV of 10 percent.

All of these statistical results indicate a high degree of precision for the majority of samples.

Results of the eight M5BW samples and within-run M5B samples presented in Table 4-11 show the similarity between the two methods. The reported nonwater-soluble sulfate particulate (NWSSP) values represent particulate concentrations corrected for water-soluble sulfates determined by ion chromatography (IC). The average NWSSP concentration (5.1 mg/dNm³) is essentially identical to the average particulate concentration of the within-run M5B samples heated to 316°C (4.8 mg/dNm³).

A maximum bias of 6 percent (low) could be introduced to the NWSSP value determined by the IC analytical procedure if all of the collected particulate was water-soluble. This is because the aliquot removed for IC analysis is equal to 6 percent of the sample, and the NWSSP result is not corrected for particulate in the aliquot that is water-soluble and non-sulfate. The actual amount of bias is independent of the water-soluble sulfate, but depends on the makeup of the NWSSP. The NWSSP can consist of nonwater-soluble particulate (NWSP) and water-soluble particulate that is not sulfate (WSPNS). Extreme examples of these types of materials would be sand (NWSP) and sodium chloride (WSPNS). If the NWSSP consisted of 75 percent sand and 25 percent salt, the NWSSP results reported using the IC procedure would be biased low by 1.5 percent (6 percent of the WSPNS). For most boiler exhaust gases the amount of WSPNS in the particulate, and the resultant bias to the reported NWSSP, should be relatively low.

The close agreement between the M5B and M5BW samples suggests that the volatile material lost during heating at 316°C is also water-soluble sulfate, which for fossil-fuel-fired boilers is most likely sulfuric acid.

This initial conclusion is altered by the results in Table 4-12. These results indicate that a significant portion of the particulate remaining in samples heat-conditioned to 316°C is water-soluble sulfate. Any adjustment to M5B results (at 316°C) for residual water-soluble sulfate would make them lower than corresponding M5BW results, thus indicating that a portion of the

volatile material lost during heating was not water-soluble sulfate. Because of the low absolute magnitude of sample weights and the relatively large number of analyses performed to achieve these results, the apparent differences may be insignificant. It should be noted that these results are consistent with a similar study at a fluid catalytic cracking unit regenerator with respect to the occurrence of residual sulfates in samples heat-conditioned to 316°C, yet inconsistent with the possibility that a portion of the volatile matter was nonwater-soluble sulfate.[2]

SECTION 6

QUALITY ASSURANCE

Because the goal of testing is to produce representative emission results, quality assurance is one of the main facets of stack sampling. Quality assurance guidelines provide the detailed procedures and actions necessary for defining and producing acceptable data. Four such documents were used in this test program to ensure the collection of acceptable data and to provide a definition of unacceptable data. These documents are: 1) the source-specific Test Plan prepared by PEDCo and reviewed by Emission Measurement Branch; 2) the EPA Quality Assurance Handbook Volume III, EPA-600/4-77-027, 3) the PEDCo Environmental Emission Test Quality Assurance Plan, and 4) the PEDCo Environmental Laboratory Quality Assurance Plan. The last two, which are PEDCo's general guideline manuals, define the company's standard operating procedures and are followed by the emission testing groups and the laboratory groups.

Appendix F provides more detail on the quality assurance procedures, such as QA objective; data reduction; quality control checks; performance and system audits; preventive maintenance; precision, accuracy, and completeness; corrective action; and quality assurance reports to management.

Relative to this specific test program, the following steps were taken to ensure that the testing and analytical procedures produced quality data.

- Calibration of all field sampling equipment. (Appendix E describes calibration guidelines in more detail.)
- Checks on train configuration and calculations.
- Onsite quality assurance checks such as sampling train, pitot tube, and Orsat line leak checks, and quality assurance checks of all test equipment prior to use.
- Use of designated analytical equipment and sampling reagents.

Table 6-1 lists the sampling equipment used for quad train particulate and SO_2 testing as well as the calibration guidelines and limits. In addition to the pre- and post-test calibrations, a field audit was performed on the meter boxes used for the sampling. PEDCo constructed critical orifices for use in this audit. Figures 6-1a through 6-1d show audit runs for each dry gas meter used for testing. Figures 6-2a and 6-2b show thermocouple digital indicator audit runs. Figures 6-3a and 6-3b show thermometer and thermocouple audit data collected during pretest equipment checks.

Between runs, onsite preliminary calculation checks were performed to verify isokinetic sampling rates and to compare moisture contents and other parameters with expected values. These checks were used to ensure that the tests were conducted properly. An example isokinetic calculation sheet is shown in Figure 6-4.

As a check on the reliability of the method used to analyze particulate samples, sets of filters that had been preweighed in

TABLE 6-1. FIELD EQUIPMENT CALIBRATION

Equipment	Train	I.D. No.	Calibrated against	Allowable error	Actual error	Within allowable limits	Comments
Meter box	A	FB-4	Wet test meter	Y ±0.02 Y	+0.005	X	
				ΔH @ ±0.15	-0.09	X	
				(Y ±0.05 Y post-test)	-0.022	X	
	B	FB-8			+0.009	X	
					-0.07	X	
					-0.012	X	
	C	FB-3			+0.003	X	
					-0.09	X	
					+0.002	X	
	D	FB-5			-0.002	X	
					+0.07	X	
					+0.002	X	
Pitot tube	All	183	Geometric specifications	See Appendix E	OK	X	Visually inspected on site
	All	401			OK	X	Visually inspected on site
Digital indicator	A&B	124	Millivolt signals	0.5%	-0.4%	X	
	C&D	125			-0.2%	X	
Thermocouple	All	201	ASTM-2F	1.5%	+1.0%	X	
Orsat analyzer	All	141	Standard gas	±0.5%	+0.4%	X	

TABLE 6-1 (continued)

Equipment	Train	I.D. No.	Calibrated against	Allowable error	Actual error	Within allowable limits	Comments
Impinger thermometers	A	Quad 1	ASTM-2F	±2°F	-6°F	No	Detected out-of-calibration limits during field audit. Correction noted on field data sheets. Replaced after test series.
	B	Quad 2			-4°F	No	
	C	Quad 3			-10°F	No	
	D	Quad 4			-10°F	No	
Balance	All	M-1	Type S weights	±0.5 g	+0.4 g	X	
Barometer	All	317	NBS traceable barometer	±0.10 in.Hg (0.20 post-test)	0.00 in.Hg	X	
Dry gas thermeter	A	FB-4 Inlet	ASTM-2F	±5°F	-3°F	X	
		FB-4 Outlet			+1°F	X	
	B	FB-8 Inlet			+2°F	X	
		FB-8 Outlet			-3°F	X	
	C	FB-3 Inlet			-3°F	X	
		FB-3 Outlet			-3°F	X	
	D	FB-5 Inlet			+4°F	X	
		FB-5 Outlet			-2°F	X	
Probe nozzle	A	1-08	Caliper	Dn ±0.004 in.	0.000	X	
		1-06			0.003	X	
		2-11			0.001	X	
		2-03			0.001	X	
	B	1-11			0.001	X	
		1-02			0.001	X	
		2-10			0.001	X	
		2-01			0.001	X	
	C	1-12			0.001	X	
		1-01			0.001	X	
		2-09			0.001	X	
		2-02			0.001	X	
	D	1-09			0.002	X	
		1-04			0.002	X	
		2-12			0.001	X	
		2-07			0.001	X	

AUDIT REPORT DRY GAS METER

DATE: 11-23-82 CLIENT: EMB

BAROMETRIC PRESSURE (P_{bar}): 29.03 in. Hg METER BOX NO. FB-3

ORIFICE NO. 5 PRETEST γ: 1.006

ORIFICE K FACTOR: 5.412×10^{-4} AUDITOR: VP

VAC = 20 "Hg

Orifice manometer reading ΔH in H_2O	Dry gas meter reading V_i/V_f ft^3	Temperatures: Ambient T_{ai}/T_{af} °F	Temperatures: Dry gas meter Inlet T_{ii}/T_{if} °F	Temperatures: Dry gas meter Outlet T_{oi}/T_{of} °F	Duration of run Ø min
2.5	215.400	62	65	60	10.0
	223.917	62	65	60	

Dry gas meter volume V_m ft^3	Average temperatures: Ambient T_a °F	Average temperatures: Dry gas meter T_m °F	$V_{m_{std}}$ ft^3	$V_{m_{act}}$ ft^3	Audit γ	γ deviation %
8.517	62	625	8.412	8.268	0.983	-2.3

$V_{m_{std}}$	$V_{m_{act}}$
$\frac{(17.647)(V_m)(P_{bar} + \Delta H/13.6)}{(T_m + 460)}$	$\frac{(1203)(\quad \emptyset \quad)(\quad K \quad)(P_{bar})}{(T_a + 460)^{1/2}}$
8.412	8.268

Audit γ	γ deviation, %
$\frac{V_{m\ act}}{V_{m\ std}}$	$\frac{(\gamma \text{ audit} - \gamma \text{ pre-test})(100\%)}{(\gamma \text{ audit})}$
0.983	

Audit γ must be in the range, pre-test $\gamma \pm 0.05\ \gamma$

Figure 6-1a. Audit report dry gas meter.

AUDIT REPORT DRY GAS METER

DATE: 11/23/82

CLIENT: USEPA

BAROMETRIC PRESSURE (P_{bar}): 29.03 in. Hg

METER BOX NO. FB-4

ORIFICE NO. 10

PRETEST γ: 1.037

ORIFICE K FACTOR: 4.79F x10^{-4}

AUDITOR: Osterhout

Orifice manometer reading ΔH in H_2O	Dry gas meter reading V_i/V_f ft^3	Temperatures: Ambient T_{ai}/T_{af} °F	Temperatures: Dry gas meter Inlet T_{ii}/T_{if} °F	Temperatures: Dry gas meter Outlet T_{oi}/T_{of} °F	Duration of run Ø min
1.91	244.000	61	67	62	15:07
	255.000	61	67	62	15.095

Vac

16.5

Dry gas meter volume V_m ft^3	Average temperatures: Ambient T_a °F	Average temperatures: Dry gas meter T_m °F	$V_{m_{std}}$ ft^3	$V_{m_{act}}$ ft^3	Audit γ	γ deviation %
11.000	61	64.5	10.796	11.081	1.026	-1.07

$V_{m_{std}}$	$V_{m_{act}}$
$\frac{(17.647)(V_m)(P_{bar} + \Delta H/13.6)}{(T_m + 460)}$	$\frac{(1203)(\quad Ø \quad)(\quad K \quad)(P_{bar})}{(T_a + 460)^{1/2}}$

Audit γ	γ deviation, %
$\frac{V_{m\ act}}{V_{m\ std}}$	$\frac{(\gamma \text{ audit} - \gamma \text{ pre-test})(100\%)}{(\gamma \text{ audit})}$

Audit γ must be in the range, pre-test γ ± 0.05 γ

Figure 6-1b. Audit report dry gas meter.

AUDIT REPORT DRY GAS METER

DATE: 11-23-82

CLIENT: EMB

BAROMETRIC PRESSURE (P_{bar}): 29.03 in. Hg

METER BOX NO. FB-5

ORIFICE NO. 11

PRETEST γ: 0.988

ORIFICE K FACTOR: 4.890×10^{-4}

AUDITOR: JP

VAC = 20" Hg

Orifice manometer reading ΔH in H_2O	Dry gas meter reading V_i/V_f ft^3	Temperatures: Ambient T_{ai}/T_{af} °F	Temperatures: Dry gas meter Inlet T_{ii}/T_{if} °F	Temperatures: Dry gas meter Outlet T_{oi}/T_{of} °F	Duration of run Ø min
1.95	905.000	61	67	63	10:04
	912.700	61	68	63	⇒ 10.07

Dry gas meter volume V_m ft^3	Average temperatures: Ambient T_a °F	Average temperatures: Dry gas meter T_m °F	$V_{m_{std}}$ ft^3	$V_{m_{act}}$ ft^3	Audit γ	γ deviation %
7.70	61	65	7.55	7.53	0.998	1.0

$V_{m_{std}}$	$V_{m_{act}}$
$\frac{(17.647)(V_m)(P_{bar} + \Delta H/13.6)}{(T_m + 460)}$	$\frac{(1203)(\quad \emptyset \quad)(\quad K \quad)(P_{bar})}{(T_a + 460)^{1/2}}$
7.551	7.534

Audit γ	γ deviation, %
$\frac{V_{m\ act}}{V_{m\ std}}$	$\frac{(\gamma \text{ audit} - \gamma \text{ pre-test})(100\%)}{(\gamma \text{ audit})}$
0.998	1.0

Audit γ must be in the range, pre-test $\gamma \pm 0.05\ \gamma$

Figure 6-1c. Audit report dry gas meter.

AUDIT REPORT DRY GAS METER

DATE: 11/23/82 CLIENT: USEPA

BAROMETRIC PRESSURE (P_{bar}): 29.03 in. Hg METER BOX NO. FB-8

ORIFICE NO. 13 PRETEST γ: 0.998

ORIFICE K FACTOR: 4.591×10^{-4} AUDITOR: Osterhout

Orifice manometer reading ΔH in H_2O	Dry gas meter reading V_i/V_f ft^3	Temperatures: Ambient T_{ai}/T_{af} °F	Temperatures: Dry gas meter Inlet T_{ii}/T_{if} °F	Temperatures: Dry gas meter Outlet T_{oi}/T_{of} °F	Duration of run Ø min
1.70	958.000	61	62	58	15.05
	968.800	61	62	59	

Vac

17.6

Dry gas meter volume V_m ft^3	Average temperatures: Ambient T_a °F	Average temperatures: Dry gas meter T_m °F	$V_{m_{std}}$ ft^3	$V_{m_{act}}$ ft^3	Audit γ	γ deviation %
10.800	61	60.25	10.681	10.596	.992	-.60

$V_{m_{std}}$	$V_{m_{act}}$
$\frac{(17.647)(V_m)(P_{bar} + \Delta H/13.6)}{(T_m + 460)}$	$\frac{(1203)(\quad \text{Ø} \quad)(\quad K \quad)(P_{bar})}{(T_a + 460)^{1/2}}$

Audit γ	γ deviation, %
$\frac{V_{m_{act}}}{V_{m_{std}}}$	$\frac{(\gamma \text{ audit} - \gamma \text{ pre-test})(100\%)}{(\gamma \text{ audit})}$

Audit γ must be in the range, pre-test $\gamma \pm 0.05\ \gamma$

Figure 6-1d. Audit report dry gas meter.

THERMOCOUPLE DIGITAL INDICATOR
AUDIT DATA SHEET

Date 11/23/82 Indicator No. 124 Operator DRO

Test Point No.	Millivolt signal*	Equivalent temperature, °F*	Digital indicator temperature reading, °F	Difference, %
1		32.0	32	0.00
2		102.2	102	-0.04
3		451.1	452	+0.10
4		1127	1130	+0.19
Ambient		61	60	-0.19

Percent difference must be less than or equal to 0.5%.

Percent difference:

$$\frac{(\text{Equivalent temperature } °R - \text{Digital indicator temperature reading } °R)(100\%)}{(\text{Equivalent temperature } °R)}$$

Where °R = °F + 460°F

* These values are to be obtained from the calibration data sheet for the calibration device.

Figure 6-2a. Thermocouple digital indicator audit data sheet.

THERMOCOUPLE DIGITAL INDICATOR
AUDIT DATA SHEET

Date 11-23-82 Indicator No. 125 Operator JP

Test Point No.	Millivolt signal*	Equivalent temperature, °F*	Digital indicator temperature reading, °F	Difference, %
1		32,0	33.9	-0,39
2		102.2	103,1	< -0,39
3		451.1	452.1	< -0,39
4		1127	1128.3	< -0,39

Percent difference must be less than or equal to 0.5%.

Percent difference:

$$\frac{(\text{Equivalent temperature } °R - \text{Digital indicator temperature reading } °R)(100\%)}{(\text{Equivalent temperature } °R)}$$

Where °R = °F + 460°F

* These values are to be obtained from the calibration data sheet for the calibration device. DIC #1

Figure 6-2b. Thermocouple digital indicator audit data sheet.

ON-SITE AUDIT DATA SHEET

Audit Name: Mare Power - EMB Date: 11/23/82 Auditor: DRC

Equipment	Reference	Reference Value	Value Determined	Deviation	Max. Allowable Deviation
Meter box inlet thermo.	ASTM-3F at ambient temp. FB 4	61	64	+3	5°F
	FB 8	61	59	-2	
Meter box outlet thermo.	ASTM-3F at ambient temp. FB 4	61	60	-1	5°F
	FB 8	61	57	-4	
Impinger thermometer	ASTM-3F at ambient temp. A	61	55	-6	2°F
	B	61	57	-4	
Stack thermometer or Thermocouple	ASTM-3F at ambient temp.				7°F
	ASTM-3F at stack temp.				See table
Orsat analyzer	% O_2 in ambient air	20.8%			0.7%
Trip balance	IOLM std. weight				0.5 grams
Barometer	Corrected* NWS value				0.20 in. Hg

Reference temp. °F	32-140	141-273	274-406	407-540	541-673	674-760
Max. deviation °F	7	9	11	13	15	17

* Correction factor:

NWS value (in. Hg) - [Altitude (ft)/1000(ft/in. Hg)] + 0.74 in. Hg**

** 0.74 in. Hg is the nominal correction factor for the reference barometer against which the field barometer was calibrated.

If it is not feasible to perform the audit on any piece of equipment, record "N/A" in the space provided for the data.

Figure 6-3a. On-site audit data sheet.

ON-SITE AUDIT DATA SHEET

Audit Name: MONO POWER-EMB Date: 11-23-82 Auditor: JP

Equipment	Reference	Reference Value	Value Determined	Deviation	Max. Allowable Deviation
Meter box inlet thermo.	ASTM-3F at ambient temp. FB-3	62	63	+1	5°F
	FB-5	63	65	+2	
Meter box outlet thermo.	ASTM-3F at ambient temp. FB-3	62	60	-2	5°F
	FB-5	62	64	+2	
Impinger thermometer	ASTM-3F at ambient temp. C	64	50	-14 ~~xxx~~	2°F
	D	63	52	-11 ~~xxx~~	
Stack ~~thermometer~~ FILTER THERMO-COUPLE or Thermocouple	ASTM-3F at ambient temp. C	66	69.8	+4	7°F
	D	66	69.5	+4	
	ASTM-3F at stack temp.				See table
Orsat analyzer	% O_2 in ambient air	20.8%			0.7%
~~Fairbanks~~ METTLER balance	IOLM std. weight	500g	499.8g	-0.2	0.5 grams
Barometer	Corrected* NWS value				0.20 in. Hg

Reference temp. °F	32-140	141-273	274-406	407-540	541-673	674-760
Max. deviation °F	7	9	11	13	15	17

* Correction factor:

NWS value (in. Hg) - [Altitude (ft)/1000(ft/in. Hg)] + 0.74 in. Hg**

** 0.74 in. Hg is the nominal correction factor for the reference barometer against which the field barometer was calibrated.

If it is not feasible to perform the audit on any piece of equipment, record "N/A" in the space provided for the data.

~~xxx~~ ADD CORRECTION TO ACTUAL READINGS

Figure 6-3b. On-site audit data sheet.

ISOKINETIC CALCULATION

SITE MONO #1 TEST NO. 9

		RUN 1	RUN 2	RUN 3	RUN 4
Volume of dry gas sampled corrected to standard conditions. Note: V_m must be corrected for leakage if any leakage rates exceed L_a). $V_{m_{std}} = 17.65 \times V_m \times Y \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m}\right]$ =	V_m, ft^3	114.0	116.3	113.5	114.9
	Y	1.037	.998	1.006	0.988
	P_{bar}, in.Hg	29.73			
	$\overline{\Delta H}$, $in.H_2O$	3.4			
	$\overline{T_m}$, °R	70 530	66 526	72 532	78 538
	$V_{m_{std}}$, dscf	116.4	115.2	117.0	115.0
Volume of water vapor at standard conditions, ft^3. $V_{w_{std}} = 0.04707 V_{lc}$ =	V_{lc}, g	343.1	357.8	341.4	360.9
	$V_{w_{std}}$, ft^3	16.15	16.56	16.07	16.99
Moisture content in stack gas. $B_{ws} = \frac{V_{w_{std}}}{V_{m_{std}} + V_{w_{std}}}$ =	B_{ws}	.122	.126	.125	.129
	$1-B_{ws}$	.878	.874	.875	.871
Dry molecular weight of stack gas, lb/lb-mole. $M_d = 0.440$ (% CO_2) + 0.320 (% O_2) + 0.280 (% N_2 + % CO) =	% CO_2	12.9			
	% O_2	5.8			
	% N_2 + % CO				
	M_d, lb/lb-mole	30.2			
Molecular weight of stack gas. $M_s = M_d (1-B_{ws}) + 18 B_{ws}$ =	M_s, lb/lb-mole	28.7			
Stack velocity at stack conditions, fps. $V_s = 85.49\ Cp \left(\text{avg. } \sqrt{\Delta P}\right) \sqrt{\frac{T_s}{P_s M_s}}$ =	P_{static}, $in.H_2O$	-1.5			
	P_s, in.Hg	29.22			
	$\overline{T_s}$, °R	171 631			
	$\overline{\sqrt{\Delta P}}$	1.35			
	Cp	0.84			
	V_s, fps	84.1			
Isokinetic variation $\%\ I = \frac{V_{m_{std}} \times \frac{T_s}{2} \times 17.32}{V_s \times D_n^2 \times \theta \times P_s \times (1-B_{ws})}$	Dn, in.	.222	.224	.220	0.220
	θ, min.	120			
	% I	99.7	100.0	98.0	101.1

Figure 6-4. Isokinetic calculations.

the lab and acetone blanks were submitted for thermogravimetric analysis in a manner similar to the actual samples. Table 6-2 summarizes the results of blank filter and reagent analysis.

Audit solutions prepared by EPA were used to check the analytical procedures and reagents for SO_2 sampling analysis. Table 6-3 presents the results of this analytical audit. Table 6-4 summarizes the results of SO_2 reagent blank analyses. The audit test and blank analyses show that the analytical techniques were good.

Filter and deionized water blanks were analyzed to check the reliability of the analytical methods used to determine nonwater-soluble sulfate particulate. Table 6-5 presents the results of the blank reagent analyses.

The sampling equipment, reagents, and analytical procedures for this test series were in compliance with all necessary guidelines set forth for accurate test results as described in Volume III of the Quality Assurance Handbook.*

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*Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, EPA-600/4-77-027b, August 1977.

TABLE 6-2. THERMOGRAVIMETRIC REAGENT BLANK ANALYSIS

Sample type	I.D. No.	Initial volume, ml	Net blank weight, mg			
			Ambient	160°C	232°C	316°C
Filter - (Whatman RA 934AH)	CR341	NA	0.2	-0.1	0.0	-0.1
Acetone	CR373	272	3.7	1.1	1.6	0.8
Acetone	CR374	208	2.7	0.5	0.4	-1.5
Acetone	CR375	316	2.8	1.9	1.4	0.8

NA = Not applicable

TABLE 6-3. AUDIT REPORT SO_2 ANALYSIS

Plant U.S EPA - MON. POWER PN Number 3530-14

Date samples received 12-3-83 Date analyzed 12-14-83

Samples analyzed by DAN SCHEFFEL

Reviewed by T. Wagner Date of Review 1-25-83

Sample Number	mg SO_2/dscm Determined	Source of Sample	Accepted Value	% Difference
SC581 7557 CR554	1767.3	T. Wagner	1765.7	+0.1
SC581 4214 CR541	2344.6	T. Wagner	2402.2	-2.4

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TABLE 6-4. SO_2 REAGENT BLANK ANALYSES

Sample type	I.D. No.	Net blank weight, mg	
		as SO_2	as H_2SO_4
80% IPA	CR446	-	<0.1
	CR447	-	<0.1
	CR448	-	<0.1
	CR449	-	<0.1
10% Hydrogen peroxide	CR490	<1	-
	CR491	<1	-
	CR492	<1	-
	CR493	<1	-

TABLE 6-5. NONWATER-SOLUBLE SULFATE PARTICULATE REAGENT BLANK ANALYSIS

Sample type	I.D. No.	Net weight of particulate plus ammonium sulfate, mg	C_{SO_4},[a] mg/liter	V_{evap}, ml	NWSSP, mg
Filter	CR394	1.6	3.63	235	0.4
Acetone	CR403	1.7	0.29	403	1.5
Filter	CR497	(-0.2)	2.75	235	(-1.1)
Acetone	CR404	1.5	0.13	250	1.5
Filter	CR498	1.3	2.71	235	0.4
Acetone	CR405	0.7	0.30	360	0.6
Filter	CR499	2.6	2.81	235	1.7

[a]A 15-ml aliquot was removed from sample for ion chromatography analysis.

SECTION 7

REFERENCES

1. PEDCo Environmental, Inc. Laboratory Evaluation Report - Analytical Method for Determining the Particulate Weight of EPA Method 5 Exclusive of Water-Soluble Particulate. Method Development and Testing for FCCU Regenerators. EPA Contract No. 68-02-3546, Work Assignment No. 14, October 1982.

2. PEDCo Environmental, Inc. Emission Test Report. Method Development and Testing for FCCU Regenerators. EPA Contract No. 68-02-3546, Work Assignment No. 14, December 1982.

3. Mitchell, W. J., and M. R. Midgett. A Means to Evaluate the Performance of Stationary Source Test Methods. Environmental Science and Technology, 10:85-88, 1976.

4. Oldaker, G. B. Condensibile Particulate and Its Impacts on Particulate Measurements. Draft Report, EPA Contract No. 68-01-4148, Task No. 69. May 1980.

5. Peters, E. T., and J. W. Adams. Sulfur Dioxide Interaction With Filters Used for Method 5 Stack Sampling. In: Workshop Proceedings on Primary Sulfate Emissions From Combustion Sources, Volume I - Measurement Technology. EPA-600/9-78-020a, 1978. p. 199-202.

6. Cushing, K. W. Particulate Sampling in Process Streams in the Presence of Sulfur Dioxide. In: Workshop Proceedings on Primary Sulfate Emissions From Combustion Sources, Volume I - Measurement Technology. EPA-600/9-78-020a, 1978. pp. 202-227.

APPENDIX A

COMPUTER PRINTOUTS AND EXAMPLE CALCULATIONS

FIELD DATA

PLANT	MONO POWER-PLEASANTS	DATE	11/29/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	1AM5B
SAMPLE TYPE	M5R	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	DD	NOZZLE I-DB : I.D.	.185
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	28.94	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB4
FILTER NUMBER(S)	0002756	METER HEAD DIFF.	1.87
STACK INSIDE DIM.(IN)	240.00 .00		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.		HEATER BOX SETTING	320.
LEAKAGE	.006 CFM @ 6.0 IN.HG		
METER CALIB. FACTOR	1.037		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1130	256.564									
	10.0	0	262.800	1.500	1.37	1.37	145.	50.	50.	5.0	327.	46.
	20.0	0	268.940	1.500	1.38	1.38	145.	55.	50.	5.0	324.	43.
	30.0	0	275.120	1.500	1.38	1.38	147.	58.	51.	5.0	313.	43.
	40.0	0	281.130	1.400	1.29	1.29	147.	60.	53.	4.7	319.	51.
	50.0	0	287.410	1.500	1.39	1.39	147.	63.	54.	4.8	327.	72.
	60.0	0	293.470	1.400	1.30	1.30	146.	64.	55.	4.7	334.	69.
	70.0	0	299.680	1.500	1.39	1.39	146.	65.	56.	4.9	334.	68.
	80.0	0	305.890	1.500	1.39	1.39	148.	66.	56.	4.9	323.	72.
	90.0	0	312.220	1.600	1.49	1.49	146.	67.	57.	5.1	313.	62.
	100.0	0	318.370	1.500	1.40	1.40	148.	67.	57.	5.0	316.	61.
	110.0	0	324.600	1.500	1.40	1.40	146.	67.	57.	5.1	313.	61.
	120.0	1330	330.965	1.600	1.49	1.49	146.	67.	58.	5.3	327.	62.
TOTALS	120.0		74.401									
AVERAGE					1.39	1.39	146.	62.	55.	5.0	323.	59.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MONO POWER-PLEASANTS — DO

TEST 1AMSB UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/29/82	11/29/82
TB	TIME-START	1130	1130
TF	TIME-FINISH	1330	1330
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.037	1.037
DN	SAMPLING NOZZLE DIAMETER	.185 IN	4.7 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.39 IN-H2O	35.3 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	74.401 CU-FT	2.107 CU-M
TM	AVERAGE GAS METER TEMP	58.5 F	14.7 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	76.268 SCF	2.160 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	226.3	226.3
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	10.652 SCF	.302 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.25	12.25
FMD	MOLE FRACTION DRY GAS	.877	.877
PCO2	PERCENT CO2 BY VOL., DRY	12.10	12.10
PO2	PERCENT O2 BY VOL., DRY	6.90	6.90
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.00	81.00
MD	MOLECULAR WT-DRY STACK GAS	30.21	30.21
MWS	MOLECULAR WT-STACK GAS	28.72	28.72

PB	BAROMETRIC PRESSURE	28.94	IN-HG	735.08	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	28.83	IN-HG	732.27	MM-HG
TS	AVERAGE STACK TEMP	146.	F	64.	C
VS	AVG STACK GAS VELOCITY	75.3	FPS	22.9	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	62658728.	SCFH	1774307.	SCMH
QS	ACTUAL STACK FLOW RATE	85117440.	ACFH	2410271.	ACMH
ISO	PERCENT ISOKINETIC	102.4		102.4	
MN	FILTERABLE PART MG. EPA 5	25.9		25.9	
CS	FILTERABLE PART	.0052	GR/DSCF*	11.994	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	46.910	LB/HR	21.28	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	1910.0		1910.0	
CS	SULFUR DIOXIDE	.3864	GR/DSCF*	884.474	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	3459.384	LB/HR	1569.18	KG/HR
MN	SULFURIC ACID MG. EPA 5	18.3		18.3	
CS	SULFURIC ACID	.0037	GR/DSCF*	8.474	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	33.145	LB/HR	15.03	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 1AMSB

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 74.401 * 1.037 * (28.94 + 1.389 / 13.6)}{(58. + 460.)} = 76.268 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 226. = 10.65 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 10.65}{76.268 + 10.65} = 12.25 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.3}{100.} = .877$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.10*44/100) + (6.9*32/100) + ((81.0+ .0) * 28/100 = 30.21

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.21* (1. -(12.25/100)) + 18. * (12.25/100) = 28.72

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 361.852 / (SQRT(28.72 * 28.83) * 12. = 75.26 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 75.26 * 45239. 3600/144 = 85117440. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 85117440. * 28.83 * (1. - (12.25/100))}{(146. + 460.)} = 62658728. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(146.+460.))*((0.002669* 226.)+(74.401*1.037*(28.94+(1.389/13.6))/(58.+460.)))}{120. * 75.26 * 28.83 * .185 * .185} = 102.43 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 25.9 * 15.43 / 76.268 = .0052 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0052 * 62658728. / (15.43 * 453.6) = 46.910

FIELD DATA

PLANT	MONO POWER-PLEASANTS	DATE	11/29/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	18M58
SAMPLE TYPE	M5D	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	DD	NOZZLE I-II : I.D.	.186
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	28.94	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FBB
FILTER NUMBER(S)	0002755	METER HEAD DIFF.	1.90
STACK INSIDE DIM.(IN)	240.00 .00		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.		HEATER BOX SETTING	320.
LEAKAGE	.008 CFM @ 5.0 IN.HG		
METER CALIB. FACTOR	.998		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1131	969.456									
	10.0	0	975.740	1.500	1.37	1.37	145.	47.	46.	3.0	318.	47.
	20.0	0	981.890	1.500	1.37	1.37	145.	50.	46.	2.9	318.	44.
	30.0	0	987.930	1.500	1.38	1.38	147.	54.	47.	3.4	311.	44.
	40.0	0	993.960	1.400	1.29	1.29	147.	57.	48.	3.8	316.	50.
	50.0	0	.300	1.500	1.39	1.39	147.	59.	49.	4.2	319.	63.
	60.0	0	6.420	1.400	1.30	1.30	146.	61.	50.	4.2	317.	66.
	70.0	0	12.750	1.500	1.39	1.39	146.	62.	51.	4.3	316.	69.
	80.0	0	19.120	1.500	1.39	1.39	148.	62.	52.	4.4	313.	71.
	90.0	0	25.660	1.600	1.49	1.49	146.	63.	52.	4.7	313.	66.
	100.0	0	31.950	1.500	1.40	1.40	148.	63.	53.	4.7	313.	66.
	110.0	0	38.300	1.500	1.40	1.40	146.	64.	54.	4.7	310.	63.
	120.0	1331	44.810	1.600	1.49	1.49	146.	64.	54.	4.8	312.	57.
TOTALS	120.0		75.354									
AVERAGE					1.39	1.39	146.	59.	50.	4.1	315.	59.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MONO POWER-PLEASANTS — DD

TEST 18M5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/29/82	11/29/82
TB	TIME-START	1131	1131
TF	TIME-FINISH	1331	1331
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.998	.998
DN	SAMPLING NOZZLE DIAMETER	.186 IN	4.7 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.39 IN-H2O	35.3 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	75.354 CU-FT	2.134 CU-M
TM	AVERAGE GAS METER TEMP	54.5 F	12.5 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	74.912 SCF	2.121 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	298.5	298.5
VWS	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	14.050 SCF	.398 SLM
BWO	PERCENT MOISTURE BY VOLUME	15.79	15.79
FMD	MOLE FRACTION DRY GAS	.842	.842
PCO2	PERCENT CO2 BY VOL., DRY	12.10	12.10
PO2	PERCENT O2 BY VOL., DRY	6.90	6.90
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.00	81.00
MD	MOLECULAR WT-DRY STACK GAS	30.21	30.21
MWS	MOLECULAR WT-STACK GAS	28.28	28.28

PB	BAROMETRIC PRESSURE	28.94	IN-HG	735.08	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	28.83	IN-HG	732.27	MM-HG
TS	AVERAGE STACK TEMP	146.	F	64.	C
VS	AVG STACK GAS VELOCITY	75.8	FPS	23.1	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	60589328.	SCFH	1715708.	SCMH
QS	ACTUAL STACK FLOW RATE	85765264.	ACFM	2428615.	ACMM
ISO	PERCENT ISOKINETIC	102.9		102.9	
MN	FILTERABLE PART MG. EPA 5	79.7		79.7	
CS	FILTERABLE PART	.0164	GR/DSCF*	37.575	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	142.112	LB/HR	64.46	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	2020.0		2020.0	
CS	SULFUR DIOXIDE	.4161	GR/DSCF*	952.349	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	3601.639	LB/HR	1633.79	KG/HR
MN	SULFURIC ACID MG. EPA 5	49.5		49.5	
CS	SULFURIC ACID	.0102	GR/DSCF*	23.337	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	88.263	LB/HR	40.04	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 18P58

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 75.354 * .998 * (28.94 + 1.388 / 13.6)}{(55. + 460.)} = 74.912 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 299. = 14.05 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 14.05}{74.912 + 14.05} = 15.79 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 15.8}{100.} = .842$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.10*44/100) + (6.9*32/100) + ((81.0+ .0) * 28/100 = 30.21

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.21* (1. -(15.79/100)) + 18. * (15.79/100) = 28.28

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 361.852 / (SQRT(28.28 * 28.83) * 12. = 75.83 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 75.83 * 45239. 3600/144 = 85765264. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 85765264. * 28.83 * (1. - (15.79/100))}{(146. + 460.)} = 60589328. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(146.+460.))*((0.002669* 299.)+(75.354* .998*(28.94+(1.388/13.6))/(55.+460.)))}{120. * 75.83 * 28.83 * .186 * .186} = 102.94 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 79.7 * 15.43 / 74.912 = .0164 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0164 * 60589328. / (15.43 * 453.6) = 142.112

FIELD DATA

PLANT	MONO POWER PLEASANTS	DATE	11/29/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	1CM5BW
SAMPLE TYPE	M5BW	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	CLARKE	NOZZLE I.D.(IN.)	.188
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	28.94	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB3
FILTER NUMBER(S)	0002759	METER H@ DIFF.	2.00
STACK INSIDE DIM.(IN)	240.00 .00		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.004 CFM @ 6.0 IN.HG		
METER CALIB. FACTOR	1.006	K FACTOR	1.1

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1130	220.085									
	10.0	1140	232.100	1.500	1.36	1.40	145.	54.	48.	4.5	321.	47.
	20.0	1150	239.007	1.500	1.35	1.40	145.	55.	48.	4.0	280.	40.
	30.0	1200	245.100	1.500	1.36	1.40	147.	60.	48.	4.5	306.	40.
	40.0	1210	250.435	1.400	1.30	1.30	147.	62.	48.	4.5	325.	52.
	50.0	1220	256.325	1.500	1.36	1.40	147.	64.	48.	4.5	325.	66.
	60.0	1230	262.400	1.400	1.30	1.30	146.	65.	49.	4.5	327.	68.
	70.0	1240	269.015	1.500	1.40	1.40	146.	67.	50.	4.5	322.	64.
	80.0	1250	275.743	1.500	1.40	1.40	146.	68.	52.	4.5	328.	60.
	90.0	1300	280.143	1.600	1.50	1.50	146.	70.	54.	5.0	313.	60.
	100.0	1310	287.710	1.500	1.40	1.40	146.	70.	54.	5.0	335.	50.
	110.0	1320	293.125	1.500	1.40	1.40	146.	70.	54.	4.5	321.	48.
	120.0	1330	299.870	1.600	1.50	1.50	146.	70.	54.	4.5	314.	44.
TOTALS	120.0		73.785									
AVERAGE					1.39	1.40	146.	64.	51.	4.5	318.	53.

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PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MONO POWER PLEASANTS — CLARKE

TEST ICM50A — UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/29/82	11/29/82
TB	TIME-START	1150	1150
TF	TIME-FINISH	1550	1550
TI	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.006	1.006
DN	SAMPLING NOZZLE DIAMETER	.188 IN	4.8 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
DPM	AVERAGE ORIFICE PRESSURE DROP	1.40 IN-H2O	35.6 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	73.785 CU-FT	2.089 CU-M
TM	AVERAGE GAS METER TEMP	57.5 F	14.2 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	73.514 SCF	2.082 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	202.4	202.4
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	9.527 SCF	.270 SCM
BWO	PERCENT MOISTURE BY VOLUME	11.47	11.47
FMD	MOLE FRACTION DRY GAS	.885	.885
PCO2	PERCENT CO2 BY VOL., DRY	12.10	12.10
PO2	PERCENT O2 BY VOL., DRY	6.90	6.90
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.00	81.00
MD	MOLECULAR WT-DRY STACK GAS	30.21	30.21
MWS	MOLECULAR WT-STACK GAS	28.81	28.81

PB	BAROMETRIC PRESSURE	28.94	IN-HG	735.08	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	28.83	IN-HG	732.27	MM-HG
TS	AVERAGE STACK TEMP	146.	F	64.	C
VS	AVG STACK GAS VELOCITY	75.1	FPS	22.9	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	63112392.	SCFH	1787154.	SCMH
QS	ACTUAL STACK FLOW RATE	84976224.	ACFH	2406272.	ACMH
ISO	PERCENT ISOKINETIC	94.9		94.9	
MN	NWSSP MG. EPA 5	11.2		11.2	
CS	NWSSP	.0024	GR/DSCF*	5.381	MG/DSCM
PMR	NWSSP EMISSION RATE	21.198	LB/HR	9.62	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	1970.0		1970.0	
CS	SULFUR DIOXIDE	.4135	GR/DSCF*	946.441	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	3728.556	LB/HR	1691.27	KG/HR
MN	SULFURIC ACID MG. EPA 5	107.0		107.0	
CS	SULFURIC ACID	.0225	GR/DSCF*	51.406	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	202.516	LB/HR	91.86	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.1CM50A

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 73.785 * 1.006 * (28.94 + 1.400 / 13.6)}{(58. + 460.)} = 75.514 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWL = .04707 * VLC

VWL = .04707 * 202. = 9.53 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWL) / (VMSTD + VWL)

$$BWO = \frac{100. * 9.53}{75.514 + 9.53} = 11.47 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 11.5}{100.} = .885$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.10*44/100) + (6.9*32/100) + ((81.0+ .0) * 28/100 = 30.21

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.21* (1. -(11.47/100)) + 18. * (11.47/100) = 28.81

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PWTS)

VS = 85.49 * .84 * 361.852 / (SQRT(28.81 * 28.83) * 12. = 75.14 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 75.14 * 45239. 3600/144 = 84976224. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 84976224. * 28.83 * (1. - (11.47/100))}{(146. + 460.)} = 65112392.\ SCFM$$

PERCENT ISOKINETIC

ISO = (305.56*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TI*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(146.+460.))*((0.002669*202.)+(13.785*1.006*(29.94+(1.400/13.6))/(58.+460.)))}{120. * 75.14 * 28.83 * .188 * .188} = 94.92\ PERCENT$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 11.2 * 15.43 / 73.514 = .0024 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0024 * 65112392. / (15.43 * 453.6) = 21.198

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FIELD DATA

PLANT	MORO POWER PLEASANTS	DATE	11/29/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	10M58R
SAMPLE TYPE	M5RR	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	CLARKE	NOZZLE ID#2 : I.D.	.165
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	.0
BAR.PRESS.(IN.HG)	28.94	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	F85
FILTER NUMBER(S)	0002753	METER HEAD DIFF.	1.95
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	320.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.	201	K FACTOR	1.1
LEAKAGE	.008 CFM @ 6.0 IN.HG		
METER CALIB. FACTOR	.988		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O) DESIRED	ACTUAL	STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F) INLET	OUTLET	PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
INIT	0	1130	915.910									
	10.0	1140	921.900	1.500	1.36	1.40	145.	54.	54.	5.0	348.	52.
	20.0	1150	928.255	1.500	1.35	1.40	145.	56.	53.	5.0	320.	40.
	30.0	1200	934.600	1.500	1.37	1.40	147.	62.	54.	5.5	341.	40.
	40.0	1210	940.170	1.400	1.30	1.30	147.	68.	55.	5.5	321.	52.
	50.0	1220	947.225	1.500	1.40	1.40	147.	72.	57.	6.0	339.	64.
	60.0	1230	953.308	1.400	1.30	1.30	146.	75.	60.	6.0	302.	68.
	70.0	1240	958.902	1.500	1.40	1.40	146.	76.	61.	6.0	333.	60.
	80.0	1250	965.690	1.500	1.40	1.40	146.	78.	63.	6.0	349.	62.
	90.0	1300	972.283	1.600	1.50	1.50	146.	78.	64.	6.0	312.	64.
	100.0	1310	978.535	1.500	1.40	1.40	146.	80.	65.	6.0	324.	62.
	110.0	1320	985.200	1.500	1.40	1.40	146.	80.	65.	6.0	318.	58.
	120.0	1330	992.144	1.600	1.50	1.50	146.	80.	66.	6.0	310.	54.
TOTALS	120.0		76.226									
AVERAGE					1.39	1.40	146.	72.	60.	5.8	326.	56.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MUNO POWER PLEASANTS

TEST TEAM LEADER

CLARKE

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TEST NUMBER UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/29/82	11/29/82
TB	TIME-START	1130	1130
TF	TIME-FINISH	1330	1330
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.988	.988
DN	SAMPLING NOZZLE DIAMETER	.185 IN	4.7 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.40 IN-H2O	35.6 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	76.226 CU-FT	2.158 CU-M
TM	AVERAGE GAS METER TEMP	65.7 F	18.7 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	73.428 SCF	2.079 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	147.0	147.0
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	6.919 SCF	.196 SCM
BWO	PERCENT MOISTURE BY VOLUME	8.61	8.61
FMD	MOLE FRACTION DRY GAS	.914	.914
PCO2	PERCENT CO2 BY VOL., DRY	12.10	12.10
PO2	PERCENT O2 BY VOL., DRY	6.90	6.90
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.00	81.00
MD	MOLECULAR WT-DRY STACK GAS	30.21	30.21
MWS	MOLECULAR WT-STACK GAS	29.16	29.16

PB	BAROMETRIC PRESSURE	28.94	IN-HG	735.08	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	28.85	IN-HG	732.27	MM-HG
TS	AVERAGE STACK TEMP	146.	F	64.	C
VS	AVG STACK GAS VELOCITY	74.1	FPS	22.6	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSID	STACK FLOW RATE, DRY*	64760536.	SCFM	1833624.	SCMM
QS	ACTUAL STACK FLOW RATE	84465632.	ACFM	2391814.	ACMM
ISO	PERCENT ISOKINETIC	95.4		95.4	
MN	NWSSP MG. EPA 5	5.5		5.5	
CS	NWSSP	.0011	GR/DSCF*	2.549	MG/DSCM
PMR	NWSSP EMISSION RATE	10.305	LB/HR	4.67	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	1990.0		1990.0	
CS	SULFUR DIOXIDE	.4182	GR/DSCF*	957.164	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	3869.270	LB/HR	1755.10	KG/HR
MN	SULFURIC ACID MG. EPA 5	6.9		6.9	
CS	SULFURIC ACID	.0014	GR/DSCF*	3.319	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	13.416	LB/HR	6.09	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.1UM30A

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * \quad 76.226 * \quad .900 * (\ 28.94 + 1.400 \ / \ 13.6)}{(\ 60. + 460.)} = \quad 15.428 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 147. = 6.92 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * \quad 6.92}{15.428 + \quad 6.92} = \quad 8.01 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - \quad 8.0}{100.} = \quad .914$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.1U*44/100) + (6.4*32/100) + ((81.0+ .0) * 28/100 = 30.21

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.21* (1. -(8.01/100)) + 18. * (8.01/100) = 29.16

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PMTS)

VS = 85.49 * .84 * 361.852 / (SQRT(29.16 * 28.83) * 12. = 74.68 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 74.68 * 45239. 3600/144 = 84465632. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWS/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 84465632. * 28.83 * (1. - (8.61/100))}{(146. + 460.)} = 64760536.\ SCFM$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(146.+460.))*((0.002669* 147.)+(76.226* .988*(28.94+(1.400/13.6))/(66.+460.)))}{120. * 74.68 * 28.83 * .185 * .185} = 95.42\ PERCENT$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 5.5 * 15.43 / 75.426 = .0011 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PHR = CS * QSSTD / (15.43 * 453.6)

PHR = .0011 * 64760536. / (15.43 * 453.6) = 10.305

FIELD DATA

PLANT	MONO POWER-PLEASANTS	DATE	11/29/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	2AM5BP
SAMPLE TYPE	M5B-P400	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	DD	NOZZLE I-D# : I.D.	.182
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	10.0
BAR.PRESS.(IN.HG)	28.97	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB4
FILTER NUMBER(S)	0002682	METER HEAD DIFF.	1.87
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	400.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.			
LEAKAGE	.000 CFM @ 5.0 IN.HG		
METER CALIB. FACTOR	1.037		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1525	331.169									
	10.0	0	337.270	1.500	1.25	1.25	151.	53.	53.	3.4	316.	40.
	20.0	0	342.600	1.200	1.00	1.00	153.	54.	52.	2.2	340.	40.
	30.0	0	348.110	1.300	1.08	1.08	156.	58.	52.	2.4	344.	38.
	40.0	0	353.380	1.200	1.00	1.00	157.	61.	53.	2.2	341.	40.
	50.0	0	358.740	1.200	1.01	1.01	155.	63.	54.	2.2	336.	42.
	60.0	0	364.120	1.200	1.01	1.01	153.	65.	55.	2.2	333.	44.
	70.0	0	369.450	1.200	1.02	1.02	153.	66.	56.	2.2	330.	45.
	80.0	0	375.120	1.300	1.10	1.10	155.	66.	57.	2.3	327.	47.
	90.0	0	381.330	1.600	1.35	1.35	155.	67.	58.	2.8	329.	49.
	100.0	0	387.930	1.900	1.61	1.61	155.	68.	58.	3.1	337.	50.
	110.0	0	395.300	2.000	1.70	1.70	152.	69.	59.	3.3	340.	54.
	120.0	1725	402.061	2.000	1.72	1.72	148.	69.	59.	3.3	345.	53.
TOTALS	120.0		70.892									
AVERAGE					1.24	1.24	154.	63.	56.	2.6	335.	45.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONO POWER-PLEASANTS | DD

TEST 2AM5BP UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/29/82	11/29/82
TB	TIME-START	1525	1525
TF	TIME-FINISH	1725	1725
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.037	1.037
DN	SAMPLING NOZZLE DIAMETER	.182 IN	4.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.24 IN-H2O	31.4 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	70.892 CU-FT	2.007 CU-M
TM	AVERAGE GAS METER TEMP	59.4 F	15.2 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	72.590 SCF	2.056 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	165.7	165.7
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	7.799 SCF	.221 SCM
BWO	PERCENT MOISTURE BY VOLUME	9.70	9.70
FMD	MOLE FRACTION DRY GAS	.903	.903
PCO2	PERCENT CO2 BY VOL., DRY	11.75	11.75
PO2	PERCENT O2 BY VOL., DRY	6.65	6.65
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.60	81.60
MD	MOLECULAR WT-DRY STACK GAS	30.15	30.15
MWS	MOLECULAR WT-STACK GAS	28.97	28.97

PB	BAROMETRIC PRESSURE	28.97	IN-HG	735.84	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	28.86	IN-HG	733.04	MM-HG
TS	AVERAGE STACK TEMP	154.	F	68.	C
VS	AVG STACK GAS VELOCITY	74.1	FPS	22.6	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	62807528.	SCFH	1778521.	SCMH
QS	ACTUAL STACK FLOW RATE	83800208.	ACFH	2372971.	ACMH
ISO	PERCENT ISOKINETIC	100.5		100.5	
MN	FILTERABLE PART MG. EPA 5	29.1		29.1	
CS	FILTERABLE PART	.0062	GR/DSCF*	14.158	MG/DSCM
PMN	FILTERABLE PART EMISSION RATE	55.508	LB/HR	25.18	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	1870.0		1870.0	
CS	SULFUR DIOXIDE	.3975	GR/DSCF*	909.830	MG/DSCM
PMN	SULFUR DIOXIDE EMISSION RATE	3567.009	LB/HR	1618.00	KG/HR
MN	SULFURIC ACID MG. EPA 5	33.9		33.9	
CS	SULFURIC ACID	.0072	GR/DSCF*	16.494	MG/DSCM
PMN	SULFURIC ACID EMISSION RATE	64.664	LB/HR	29.33	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.2AM5BP

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 70.892 * 1.037 * (28.97 + 1.238 / 13.6)}{(54. + 460.)} = 72.590 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 166. = 7.80 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 7.80}{72.590 + 7.80} = 9.70 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 9.7}{100.} = .903$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (11.75*44/100) + (6.6*32/100) + ((81.6+ .0) * 28/100 = 30.15

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.15* (1. -(9.70/100)) + 18. * (9.70/100) = 28.97

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PAIS)

VS = 85.49 * .84 * 357.999 / (SQRT(28.97 * 28.86) * 12. = 74.10 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 74.10 * 45239. 3600/144 = 63800208. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 63800208. * 28.86 * (1. - (9.70/100))}{(154. + 460.)} = 02807528. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(154.+460.))*((0.002669* 166.)+(70.892*1.037*(28.97+(1.238/13.6))/(59.+460.)))}{120. * 74.10 * 28.86 * .182 * .182} = 100.49 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 29.1 * 15.43 / 72.590 = .0062 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0062 * 62807528. / (15.43 * 453.6) = 55.508

FIELD DATA

PLANT	MUNO POWER-PLEASANTS	DATE	11/29/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	2BM58P
SAMPLE TYPE	M5B-P400	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	DD	NOZZLE I-D2 : I.D.	.177
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	10.0
BAR.PRESS.(IN.HG)	28.97	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FBB
FILTER NUMBER(S)	0002683	METER HEAD DIFF.	1.90
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	400.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.			
LEAKAGE	.012 CFM @ 9.5 IN.HG		
METER CALIB. FACTOR	.998		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1526	46.401									
	10.0	0	52.290	1.500	1.25	1.25	151.	51.	50.	3.0	316.	45.
	20.0	0	57.610	1.200	1.00	1.00	153.	53.	50.	3.0	342.	43.
	30.0	0	63.120	1.300	1.08	1.08	156.	57.	50.	4.3	347.	44.
	40.0	0	68.500	1.200	1.00	1.00	157.	60.	51.	4.0	347.	47.
	50.0	0	73.830	1.200	1.01	1.01	155.	62.	52.	3.8	345.	52.
	60.0	0	79.240	1.200	1.01	1.01	153.	63.	53.	3.9	338.	59.
	70.0	0	84.700	1.200	1.02	1.02	153.	64.	55.	3.7	334.	59.
	80.0	0	90.530	1.300	1.10	1.10	155.	65.	55.	3.6	331.	60.
	90.0	0	96.920	1.600	1.35	1.35	155.	65.	56.	3.7	332.	62.
	100.0	0	103.750	1.900	1.61	1.61	155.	66.	57.	3.9	333.	62.
	110.0	0	111.460	2.000	1.70	1.70	152.	67.	58.	4.0	332.	63.
	120.7	1726	118.325	2.000	1.72	1.72	148.	67.	58.	4.0	332.	63.
TOTALS AVERAGE	120.7		71.924		1.24	1.24	154.	62.	54.	3.7	336.	55.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONO POWER-PLEASANTS | DD

TEST 28M50P UNIT 1

		ENGLISH UNITS		METRIC UNITS	
TEST DATE		11/29/82		11/29/82	
TB	TIME-START	1526		1526	
TF	TIME-FINISH	1726		1726	
TT	NET TIME OF TEST, MIN.	120.7		120.7	
NP	NET SAMPLING POINTS	12		12	
Y	METER CALIBRATION FACTOR	.998		.998	
DN	SAMPLING NOZZLE DIAMETER	.177	IN	4.5	MM
CP	PITOT TUBE COEFFICIENT	.84		.84	
PM	AVERAGE ORIFICE PRESSURE DROP	1.24	IN-H2O	31.4	MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	71.924	CU-FT	2.037	CU-M
TM	AVERAGE GAS METER TEMP	57.7	F	14.3	C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	71.105	SCF	2.013	SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	208.1		208.1	
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	9.795	SCF	.277	SCM
BWO	PERCENT MOISTURE BY VOLUME	12.11		12.11	
FMD	MOLE FRACTION DRY GAS	.879		.879	
PCO2	PERCENT CO2 BY VOL., DRY	11.75		11.75	
PO2	PERCENT O2 BY VOL., DRY	6.65		6.65	
PCO	PERCENT CO BY VOL., DRY	.00		.00	
PN2	PERCENT N2 BY VOL., DRY	81.60		81.60	
MD	MOLECULAR WT-DRY STACK GAS	30.15		30.15	
MWS	MOLECULAR WT-STACK GAS	26.68		26.68	

PB	BAROMETRIC PRESSURE	28.97	IN-HG	735.84	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	28.86	IN-HG	733.04	MM-HG
TS	AVERAGE STACK TEMP	154.	F	68.	C
VS	AVG STACK GAS VELOCITY	74.5	FPS	22.7	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	61444912.	SCFM	1739936.	SCMM
QS	ACTUAL STACK FLOW RATE	84226064.	ACFM	2385030.	ACMM
ISO	PERCENT ISOKINETIC	105.8		105.8	
MN	FILTERABLE PART MG. EPA 5	26.2		26.2	
CS	FILTERABLE PART	.0057	GR/DSCF*	13.014	MG/DSCM
PMN	FILTERABLE PART EMISSION RATE	49.913	LB/HR	22.64	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	2310.0		2310.0	
CS	SULFUR DIOXIDE	.5013	GR/DSCF*	1147.377	MG/DSCM
PMN	SULFUR DIOXIDE EMISSION RATE	4400.728	LB/HR	1996.17	KG/HR
MN	SULFURIC ACID MG. EPA 5	81.8		81.8	
CS	SULFURIC ACID	.0178	GR/DSCF*	40.630	MG/DSCM
PMN	SULFURIC ACID EMISSION RATE	155.835	LB/HR	70.69	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.2HM58P

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 71.924 * .998 * (28.97 + 1.238 / 13.6)}{(58. + 460.)} = 71.105 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 208. = 9.80 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 9.80}{71.105 + 9.80} = 12.11 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.1}{100.} = .879$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PLO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (11.75*44/100) + (6.6*32/100) + ((81.6+ .0) * 28/100 = 30.15

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.15* (1. -(12.11/100)) + 18. * (12.11/100) = 28.68

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 357.999 / (SQRT(28.68 * 28.86) * 12. = 74.47 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 74.47 * 45239. 3600/144 = 84226064. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 84226064. * 28.86 * (1. - (12.11/100))}{(154. + 460.)} = 61444912. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(154.+460.))*((0.002669*208.)+(71.924*.998*(28.97+(1.238/13.6))/(58.+460.)))}{121. * 74.47 * 28.86 * .177 * .177} = 105.77 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 26.2 * 15.43 / 71.105 = .0057 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0057 * 61444912. / (15.43 * 453.6) = 49.913

FIELD DATA

PLANT	MONGO POWER PLEASANTS	DATE	11/29/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	2CM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	CLARKE	NOZZLE I-D1 : I.D.	.180
AMBIENT TEMP.(DEG.F)	58.	ASSUMED MOISTURE	10.0
BAR.PRESS.(IN.HG)	28.96	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	F83
FILTER NUMBER(S)	0002684	METER HEAD DIFF.	2.00
STACK INSIDE DIM.(IN)	240.00 .00		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.015 CFM @ 4.0 IN.HG		
METER CALIB. FACTOR	1.006	K FACTOR	1.0

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1525	300.184									
	10.0	1535	306.061	1.500	1.27	1.30	151.	50.	52.	3.0	298.	42.
	20.0	1545	312.002	1.200	1.19	1.20	153.	54.	52.	3.0	329.	40.
	30.0	1555	317.525	1.300	1.12	1.10	156.	60.	54.	3.0	313.	42.
	40.0	1605	323.917	1.200	1.00	1.00	157.	64.	54.	3.0	331.	40.
	50.0	1615	328.120	1.200	1.00	1.00	155.	68.	54.	3.0	319.	42.
	60.0	1625	333.675	1.200	1.00	1.00	153.	68.	54.	3.0	320.	42.
	70.0	1635	339.127	1.200	1.00	1.00	153.	70.	54.	3.0	328.	42.
	80.0	1645	345.355	1.300	1.10	1.10	155.	72.	54.	3.0	330.	40.
	90.0	1655	351.110	1.600	1.40	1.40	155.	73.	56.	3.5	322.	40.
	100.0	1705	357.753	1.900	1.60	1.60	155.	75.	58.	4.0	320.	42.
	110.0	1715	363.636	2.000	1.70	1.70	152.	75.	58.	4.0	328.	40.
	120.0	1725	371.025	2.000	1.70	1.70	148.	76.	60.	4.0	321.	42.
TOTALS	120.0		70.841									
AVERAGE					1.26	1.26	154.	67.	55.	3.3	322.	41.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONGO POWER PLEASANTS

TEST LEADER

CLARKE

TEST 2CM5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/29/82	11/29/82
TB	TIME-START	1525	1525
TF	TIME-FINISH	1725	1725
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.006	1.006
DN	SAMPLING NOZZLE DIAMETER	.180 IN	4.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.26 IN-H2O	32.0 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	70.841 CU-FT	2.006 CU-M
TM	AVERAGE GAS METER TEMP	61.0 F	16.1 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	70.124 SCF	1.986 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	207.1	207.1
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	9.748 SCF	.276 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.20	12.20
FMD	MOLE FRACTION DRY GAS	.878	.878
PCO2	PERCENT CO2 BY VOL., DRY	11.75	11.75
PO2	PERCENT O2 BY VOL., DRY	6.65	6.65
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.60	81.60
MD	MOLECULAR WT-DRY STACK GAS	30.15	30.15
MWS	MOLECULAR WT-STACK GAS	28.66	28.66

PB	BAROMETRIC PRESSURE	28.46	IN-HG	735.58	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	28.85	IN-HG	732.78	MM-HG
TS	AVERAGE STACK TEMP	154.	F	68.	C
VS	AVG STACK GAS VELOCITY	74.5	FPS	22.7	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	61379104.	SCFM	1738072.	SCMM
QS	ACTUAL STACK FLOW RATE	84257968.	ACFM	2385933.	ACMM
ISO	PERCENT ISOKINETIC	101.6		101.6	
MR	FILTERABLE PART MG. EPA 5	56.6		56.6	
CS	FILTERABLE PART	.0125	GR/DSCF*	28.507	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	109.219	LB/HR	49.54	KG/HR
MR	SULFUR DIOXIDE MG. EPA 5	2260.0		2260.0	
CS	SULFUR DIOXIDE	.4973	GR/DSCF*	1138.251	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	4361.049	LB/HR	1978.17	KG/HR
MR	SULFURIC ACID MG. EPA 5	190.0		190.0	
CS	SULFURIC ACID	.0418	GR/DSCF*	95.694	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	366.637	LB/HR	166.31	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 2CM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 70.841 * 1.006 * (28.96 + 1.258 / 13.6)}{(61. + 460.)} = 70.124 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 207. = 9.75 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 9.75}{70.124 + 9.75} = 12.20 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.2}{100.} = .878$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (11.75*44/100) + (6.6*32/100) + ((81.6+ .0) * 28/100 = 30.15

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.15* (1. -(12.20/100)) + 18. * (12.20/100) = 28.66

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 357.999 / (SQRT(28.66 * 28.65) * 12. = 74.50 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 74.50 * 45239. 3600/144 = 84257968. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 84257968. * 28.85 * (1. - (12.20/100))}{(154. + 460.)} = 61379104. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DA)

$$ISO = \frac{(305.58*(154.+460.))*((0.002669* 207.)+(70.841*1.006*(28.96+(1.258/13.6))/(61.+460.)))}{120. * 74.50 * 28.85 * .180 * .180} = 101.56 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 56.6 * 15.43 / 70.124 = .0125 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0125 * 61379104. / (15.43 * 453.6) = 109.219

FIELD DATA

PLANT	MONGO POWER PLEASANTS	DATE	11/29/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	20M58
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	CLARKE	NOZZLE I-D# : I.D.	.182
AMBIENT TEMP.(DEG.F)	51.	ASSUMED MOISTURE	10.0
BAR.PRESS.(IN.HG)	28.96	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB5
FILTER NUMBER(S)	0002685	METER HEAD DIFF.	1.95
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	320.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.	201	K FACTOR	1.0
LEAKAGE	.005 CFM @ 6.0 IN.HG		
METER CALIB. FACTOR	.988		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1525	992.365									
	10.0	1535	999.190	1.500	1.30	1.30	151.	60.	60.	4.5	319.	40.
	20.0	1545	3.975	1.200	1.00	1.00	153.	60.	60.	4.0	338.	40.
	30.0	1555	8.888	1.300	1.10	1.10	156.	60.	60.	4.0	325.	42.
	40.0	1605	14.224	1.200	1.03	1.00	157.	70.	60.	4.0	318.	44.
	50.0	1615	20.065	1.200	1.00	1.00	155.	72.	60.	4.0	328.	48.
	60.0	1625	26.450	1.200	1.00	1.00	153.	74.	62.	4.0	331.	48.
	70.0	1635	31.300	1.200	1.00	1.00	153.	76.	64.	4.5	331.	52.
	80.0	1645	37.310	1.300	1.10	1.10	155.	77.	65.	5.0	319.	54.
	90.0	1655	44.000	1.600	1.40	1.40	155.	78.	66.	5.0	317.	50.
	100.0	1705	50.250	1.900	1.65	1.60	155.	79.	66.	5.0	325.	50.
	110.0	1715	57.201	2.000	1.76	1.80	152.	80.	67.	5.0	329.	52.
	120.0	1725	64.545	2.000	1.78	1.80	148.	81.	68.	6.0	326.	48.
TOTALS	120.0		72.180									
AVERAGE					1.26	1.26	154.	72.	63.	4.6	326.	47.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MONGO POWER PLEASANTS — CLARKE

TEST 2DH58 UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/29/82	11/29/82
TB	TIME-START	1525	1525
TF	TIME-FINISH	1725	1725
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.988	.988
DN	SAMPLING NOZZLE DIAMETER	.182 IN	4.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	1.26 IN-H2O	32.0 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	72.180 CU-FT	2.044 CU-M
TM	AVERAGE GAS METER TEMP	67.7 F	19.8 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	69.284 SCF	1.962 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	206.9	206.9
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	9.739 SCF	.276 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.32	12.32
FMD	MOLE FRACTION DRY GAS	.877	.877
PCO2	PERCENT CO2 BY VOL., DRY	11.75	11.75
PO2	PERCENT O2 BY VOL., DRY	6.65	6.65
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.60	81.60
MD	MOLECULAR WT-DRY STACK GAS	30.15	30.15
MWS	MOLECULAR WT-STACK GAS	26.65	26.65

PB	BAROMETRIC PRESSURE	28.96	IN-HG	735.58	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	28.85	IN-HG	732.78	MM-HG
TS	AVERAGE STACK TEMP	154.	F	68.	C
VS	AVG STACK GAS VELOCITY	74.5	FPS	22.7	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	61311248.	SCFH	1736151.	SCMH
QS	ACTUAL STACK FLOW RATE	84279264.	ACFH	2386536.	ACMH
ISO	PERCENT ISOKINETIC	98.3		98.3	
MN	FILTERABLE PART MG. EPA 5	34.3		34.3	
CS	FILTERABLE PART	.0076	GR/DSCF*	17.485	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	66.915	LB/HR	30.35	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	2370.0		2370.0	
CS	SULFUR DIOXIDE	.5278	GR/DSCF*	1208.115	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	4623.606	LB/HR	2097.27	KG/HR
MN	SULFURIC ACID MG. EPA 5	81.7		81.7	
CS	SULFURIC ACID	.0182	GR/DSCF*	41.647	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	159.388	LB/HR	72.30	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 2DM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 72.180 * .986 * (28.96 + 1.258 / 13.6)}{(68. + 460.)} = 69.284 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 207. = 9.74 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 9.74}{69.284 + 9.74} = 12.32 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.3}{100.} = .877$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (11.75*44/100) + (6.6*32/100) + ((81.6+ .0) * 28/100 = 30.15

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.15* (1. -(12.32/100)) + 18. * (12.32/100) = 28.65

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 357.999 / (SQRT(28.65 * 28.85) * 12. = 74.52 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 74.52 * 45239. 3600/144 = 84279264. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 84279264. * 28.85 * (1. - (12.32/100))}{(154. + 460.)} = 61311248. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(154.+460.))*((0.002669* 207.)+(72.180* .988*(28.96+(1.258/13.6))/(68.+460.)))}{120. * 74.52 * 28.85 * .182 * .182} = 98.26 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 34.3 * 15.43 / 69.284 = .0076 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0076 * 61311248. / (15.43 * 453.6) = 66.915

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FIELD DATA

PLANT	MONO POWER PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	SAM5BM
SAMPLE TYPE	M5BM	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	DD	NOZZLE 2-11 : I.D.	.222
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.19	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB4
FILTER NUMBER(S)	0002687	METER HEAD DIFF.	1.87
STACK INSIDE DIM.(IN)	240.00 .00		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.		HEATER BOX SETTING	320.
LEAKAGE	.006 CFM @ 10.0 IN.HG		
METER CALIB. FACTOR	1.037		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1018	413.334									
	10.0	0	421.930	1.500	2.75	2.75	152.	51.	51.	8.5	319.	45.
	20.0	0	430.910	1.700	3.11	3.11	157.	55.	51.	8.3	316.	42.
	30.0	0	439.990	1.700	3.12	3.12	157.	59.	51.	8.5	329.	51.
	40.0	0	449.050	1.700	3.15	3.15	156.	61.	54.	8.1	334.	46.
	50.0	0	457.800	1.600	2.97	2.97	157.	66.	56.	7.7	325.	66.
	60.0	0	466.950	1.700	3.16	3.16	154.	66.	57.	8.2	318.	63.
	70.0	0	476.090	1.700	3.16	3.16	154.	69.	58.	8.1	326.	62.
	80.0	0	485.460	1.800	3.36	3.36	154.	70.	59.	8.3	334.	56.
	90.0	0	494.630	1.700	3.20	3.20	155.	71.	60.	7.8	321.	51.
	100.0	0	504.090	1.800	3.37	3.37	156.	70.	60.	8.2	319.	48.
	110.0	0	513.760	1.900	3.55	3.55	154.	71.	61.	8.6	329.	47.
	120.0	1218	523.638	2.000	3.76	3.76	156.	70.	62.	9.1	334.	45.
TOTALS	120.0		110.104									
AVERAGE					3.22	3.22	157.	66.	57.	8.1	325.	59.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MUNO POWER PLEASANTS — DU

TEST SAMSUN — UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1018	1018
TF	TIME-FINISH	1218	1218
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.031	1.031
DN	SAMPLING NOZZLE DIAMETER	.222 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
DH	AVERAGE ORIFICE PRESSURE DROP	3.22 IN-H2O	81.8 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	110.104 CU-FT	3.118 CU-M
TM	AVERAGE GAS METER TEMP	61.1 F	16.2 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	113.777 SCF	3.222 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	296.7	296.7
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	13.966 SCF	.395 SCM
BWO	PERCENT MOISTURE BY VOLUME	10.93	10.93
FMD	MOLE FRACTION DRY GAS	.891	.891
PCO2	PERCENT CO2 BY VOL., DRY	12.00	12.00
PO2	PERCENT O2 BY VOL., DRY	6.15	6.15
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.85	81.85
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	28.92	28.92

PB	BAROMETRIC PRESSURE	29.19	IN-HG	741.43	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.00	IN-HG	736.62	MM-HG
TS	AVERAGE STACK TEMP	157.	F	70.	C
VS	AVG STACK GAS VELOCITY	80.9	FPS	24.7	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	6779352.	SCFM	1919755.	SCMM
QS	ACTUAL STACK FLOW RATE	9154184.	ACFM	2592172.	ACMM
ISO	PERCENT ISOKINETIC	98.1		98.1	
MN	NWSSP MG. EPA 5	24.0		24.0	
CS	NWSSP	.0033	GR/DSCF*	7.450	MG/DSCM
PMR	NWSSP EMISSION RATE	31.527	LB/HR	14.30	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4090.0		4090.0	
CS	SULFUR DIOXIDE	.5547	GR/DSCF*	1269.589	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5312.654	LB/HR	2431.04	KG/HR
MN	SULFURIC ACID MG. EPA 5	78.5		78.5	
CS	SULFURIC ACID	.0106	GR/DSCF*	24.367	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	103.118	LB/HR	46.77	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.SAMSHR

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 110.104 * 1.057 * (29.19 + 5.222 / 13.6)}{(81. + 460.)} = 113.777 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 297. = 13.97 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 13.97}{113.777 + 13.97} = 10.93 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 10.9}{100.} = .891$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.6*44/100) + (6.1*32/100) + ((81.3+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26* (1. -(10.93/100)) + 18. * (10.93/100) = 28.92

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 592.244 / (SQRT(28.92 * 29.08) * 12. = 80.94 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 80.94 * 45239. 3600/144 = 91541184. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 91541184. * 29.08 * (1. - (10.93/100))}{(157. + 460.)} = 67794552. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(157.+460.))*((0.002669*297.)+(110.104*1.037*(29.19+(3.222/13.6))/(61.+460.)))}{120. * 80.94 * 29.08 * .222 * .222} = 98.08 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 24.0 * 15.43 / 113.777 = .0033 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0033 * 67794552. / (15.43 * 453.6) = 31.527

FIELD DATA

PLANT	MUNO POWER PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	30M30A
SAMPLE TYPE	M5DA	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	DO	NOZZLE 2-10 : 1.0.	.221
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.19	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FBB
FILTER NUMBER(S)	0002686	METER HEAD DIFF.	1.90
STACK INSIDE DIM.(IN)	240.00 .00		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.		HEATER BOX SETTING	320.
LEAKAGE	.014 CFM @ 12.0 IN.HG		
METER CALIB. FACTOR	.998		
READ & RECORD DATA EVERY 10.0 MINUTES			

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1019	124.352									
	10.0	0	137.950	1.500	2.75	2.75	152.	48.	47.	7.4	317.	44.
	20.0	0	147.040	1.700	3.11	3.11	157.	52.	47.	9.7	318.	42.
	30.0	0	156.260	1.700	3.12	3.12	157.	53.	48.	10.2	327.	51.
	40.0	0	165.510	1.700	3.15	3.15	158.	54.	49.	10.2	326.	109.
	50.0	0	174.610	1.600	2.97	2.97	157.	61.	51.	9.9	327.	108.
	60.0	0	183.980	1.700	3.16	3.16	159.	63.	52.	10.2	329.	78.
	70.0	0	193.210	1.700	3.16	3.16	159.	64.	53.	10.0	337.	62.
	80.0	0	202.750	.800	3.36	3.36	159.	65.	54.	10.4	338.	73.
	90.0	0	212.140	1.700	3.20	3.20	155.	65.	55.	10.2	331.	52.
	100.0	0	221.800	1.800	3.37	3.37	158.	65.	56.	10.7	327.	47.
	110.0	0	231.840	1.900	3.55	3.55	159.	65.	57.	11.2	327.	46.
	120.0	1219	241.329	2.000	3.76	3.62	158.	65.	57.	11.5	325.	46.
TOTALS	120.0		112.177									
AVERAGE					3.22	3.21	157.	61.	52.	10.1	327.	63.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MUNO PUREN PLEASANTS | DU

TEST SHMSUM UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1019	1019
TF	TIME-FINISH	1219	1219
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.998	.998
DN	SAMPLING NOZZLE DIAMETER	.221 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.21 IN-H2O	81.5 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	112.177 CU-FT	3.176 CU-M
TM	AVERAGE GAS METER TEMP	56.4 F	13.5 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	112.583 SCF	3.188 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	277.2	277.2
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	13.048 SCF	.369 SCM
BWO	PERCENT MOISTURE BY VOLUME	10.39	10.39
FMO	MOLE FRACTION DRY GAS	.896	.896
PCO2	PERCENT CO2 BY VOL., DRY	12.60	12.60
PO2	PERCENT O2 BY VOL., DRY	6.15	6.15
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.25	81.25
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	28.99	28.99

PB	BAROMETRIC PRESSURE	29.19	IN-HG	741.43	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.08	IN-HG	738.62	MM-HG
TS	AVERAGE STACK TEMP	157.	F	70.	C
VS	AVG STACK GAS VELOCITY	80.8	FPS	24.6	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	68131600.	SCFH	1929283.	SCMH
QS	ACTUAL STACK FLOW RATE	91435248.	ACFH	2589172.	ACMH
ISO	PERCENT ISOKINETIC	97.4		97.4	
MN	NMSSP MG. EPA 5	10.2		10.2	
CS	NMSSP	.0014 GR/DSCF*		3.200	MG/DSCM
PMR	NMSSP EMISSION RATE	15.608 LB/HR		6.17	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4080.0		4080.0	
CS	SULFUR DIOXIDE	.5592 GR/DSCF*		1279.921	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5443.522 LB/HR		2469.09	KG/HR
MN	SULFURIC ACID MG. EPA 5	64.9		64.9	
CS	SULFURIC ACID	.0089 GR/DSCF*		20.360	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	86.586 LB/HR		39.28	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.58N5HW

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 112.177 * .998 * (29.19 + 3.210 / 13.6)}{(56. + 460.)} = 112.583 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 277. = 13.05 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 13.05}{112.583 + 13.05} = 10.39 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 10.4}{100.} = .896$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.60*44/100) + (6.1*32/100) + ((81.3+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26* (1. -(10.39/100)) + 18. * (10.39/100) = 28.99

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MAS * PS) * PNTS)

VS = 85.49 * .84 * 392.244 / (SQRT(28.99 * 29.08) * 12. = 80.85 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 80.85 * 45239. 3600/144 = 91435248. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 91435248. * 29.08 * (1. - (10.39/100))}{(157. + 460.)} = 68131600. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TI*VS*PS*ON*ON)

$$ISO = \frac{(305.58*(157.+460.))*((0.002669*277.)+(112.177*.998*(29.19+(3.210/13.6))/(56.+460.)))}{120. * 80.85 * 29.08 * .221 * .221} = 97.45 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 10.2 * 15.43 / 112.583 = .0014 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0014 * 68131600. / (15.43 * 453.6) = 13.608

FIELD DATA

PLANT	MUNGO POWER PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	3CM5B
SAMPLE TYPE	M5b	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	CLARKE	NOZZLE 2-09: I.D.	.220
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.19	SAMPLE BOX NUMBER	GDC
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB3
FILTER NUMBER(S)	0002629	METER HEAD DIFF.	2.00
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.000 CFM @ 6.5 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	1.006		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1020	383.047									
	10.0	1030	392.174	1.500	2.68	2.70	152.	50.	50.	4.0	319.	34.
	20.0	1040	400.000	1.700	3.01	3.00	157.	54.	48.	4.0	321.	36.
	30.0	1050	409.625	1.700	3.00	3.00	157.	60.	48.	5.0	328.	44.
	40.0	1100	418.455	1.700	3.05	3.05	158.	68.	49.	5.0	329.	78.
	50.0	1110	428.620	1.600	2.90	2.90	157.	71.	50.	5.0	348.	68.
	60.0	1120	436.245	1.700	3.07	3.10	159.	74.	51.	5.5	320.	64.
	70.0	1130	445.910	1.700	3.07	3.10	159.	76.	54.	6.0	327.	54.
	80.0	1140	454.735	1.800	3.28	3.30	159.	78.	55.	6.0	329.	49.
	90.0	1150	464.275	1.700	3.12	3.10	155.	80.	56.	6.0	328.	46.
	100.0	1200	473.728	1.800	3.30	3.30	158.	80.	58.	6.0	305.	44.
	110.0	1210	483.055	1.900	3.48	3.50	159.	82.	59.	6.0	323.	40.
	120.0	1220	493.098	2.000	3.70	3.70	156.	82.	64.	6.5	313.	40.
TOTALS	120.0		110.051									
AVERAGE					3.14	3.15	157.	71.	54.	5.4	324.	50.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONGO POWER PLEASANTS

TEST TEAM LEADER

CLARKE

TEST 3CM58 UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1020	1020
TF	TIME-FINISH	1220	1220
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.006	1.006
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.15 IN-H2O	79.9 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	110.051 CU-FT	3.116 CU-M
TM	AVERAGE GAS METER TEMP	62.4 F	16.9 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	110.038 SCF	3.116 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	325.0	325.0
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	15.298 SCF	.433 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.21	12.21
FMO	MOLE FRACTION DRY GAS	.878	.878
PCO2	PERCENT CO2 BY VOL., DRY	12.60	12.60
PO2	PERCENT O2 BY VOL., DRY	6.15	6.15
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.25	81.25
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	28.77	28.77

PB	BAROMETRIC PRESSURE	29.19	IN-HG	741.43	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.08	IN-HG	738.62	MM-HG
TS	AVERAGE STACK TEMP	157.	F	70.	C
VS	AVG STACK GAS VELOCITY	81.6	FPS	24.7	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	67006600.	SCFM	1897426.	SCMM
QS	ACTUAL STACK FLOW RATE	91789184.	ACFM	2599195.	ACMM
ISO	PERCENT ISOKINETIC	97.7		97.7	
MN	FILTERABLE PART MG. EPA 5	58.8		58.8	
CS	FILTERABLE PART	.0082	GR/DSCF*	18.872	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	78.937	LB/HR	35.81	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	3970.0		3970.0	
CS	SULFUR DIOXIDE	.5567	GR/DSCF*	1274.214	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5329.573	LB/HR	2417.49	KG/HR
MN	SULFURIC ACID MG. EPA 5	104.0		104.0	
CS	SULFURIC ACID	.0146	GR/DSCF*	33.380	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	139.616	LB/HR	63.33	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 3CM58

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 110.051 * 1.006 * (29.19 + 3.146 / 13.6)}{(62. + 460.)} = 110.038 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 325. = 15.30 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 15.30}{110.038 + 15.30} = 12.21 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.2}{100.} = .878$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.60*44/100) + (6.1*32/100) + ((81.3+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26* (1. -(12.21/100)) + 18. * (12.21/100) = 28.77

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PAIS)

VS = 85.49 * .84 * 392.244 / (SQRT(28.77 * 29.08) * 12. = 81.16 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 81.16 * 45239. 3600/144 = 91789184. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 91789184. * 29.08 * (1. - (12.21/100))}{(157. + 460.)} = 67006600. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(157.+460.))*((0.002669*325.)+(110.051*1.006*(29.19+(3.146/13.6))/(62.+460.)))}{120. * 81.16 * 29.08 * .220 * .220} = 97.75 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 58.8 * 15.43 / 110.038 = .0082 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0082 * 67006600. / (15.43 * 453.6) = 78.937

FIELD DATA

PLANT	MONGO POWER PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	3DM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	CLARKE	NOZZLE 1-1: 1.D.	.220
AMBIENT TEMP.(DEG.F)	50.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.19	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB5
FILTER NUMBER(S)	0002688	METER HEAD DIFF.	1.95
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.006 CFM @ 8.5 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	.988		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACULM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1020	76.490									
	10.0	1030	86.623	1.500	2.69	2.70	152.	52.	52.	7.0	324.	40.
	20.0	1040	93.500	1.700	3.04	3.00	157.	58.	54.	8.0	326.	38.
	30.0	1050	98.275	1.700	3.00	3.00	157.	56.	55.	8.5	321.	46.
	40.0	1100	113.492	1.700	3.10	3.10	158.	76.	58.	8.5	320.	88.
	50.0	1110	124.300	1.600	2.94	2.90	157.	78.	60.	8.0	319.	74.
	60.0	1120	133.217	1.700	3.12	3.10	159.	80.	62.	8.0	321.	64.
	70.0	1130	142.245	1.700	3.13	3.10	159.	81.	64.	8.0	329.	58.
	80.0	1140	151.520	1.800	3.33	3.30	159.	83.	66.	8.0	331.	51.
	90.0	1150	161.925	1.700	3.17	3.20	155.	84.	67.	8.0	328.	44.
	100.0	1200	171.830	1.800	3.34	3.30	158.	84.	68.	8.0	321.	40.
	110.0	1210	181.400	1.900	3.53	3.50	159.	85.	69.	8.0	319.	40.
	120.0	1220	191.429	2.000	3.73	3.70	156.	85.	70.	8.5	329.	36.
TOTALS	120.0											
AVERAGE			114.939		3.18	3.16	157.	75.	62.	8.0	324.	52.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONGO POWER PLEASANTS

TEST LEADER

CLARKE

TEST 3DM58 UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1020	1020
TF	TIME-FINISH	1220	1220
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.988	.988
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.16 IN-H2O	80.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	114.939 CU-FT	3.255 CU-M
TM	AVERAGE GAS METER TEMP	66.6 F	20.3 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	111.538 SCF	3.158 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	322.2	322.2
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	15.166 SCF	.429 SCM
BWO	PERCENT MOISTURE BY VOLUME	11.97	11.97
FMD	MOLE FRACTION DRY GAS	.880	.880
PCO2	PERCENT CO2 BY VOL., DRY	12.60	12.60
PO2	PERCENT O2 BY VOL., DRY	6.15	6.15
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.25	81.25
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	28.79	28.79

PB	BAROMETRIC PRESSURE	29.19	IN-HG	741.43	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.08	IN-HG	738.62	MM-HG
TS	AVERAGE STACK TEMP	157.	F	70.	C
VS	AVG STACK GAS VELOCITY	81.1	FPS	24.7	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	67152648.	SCFH	1901567.	SCMH
QS	ACTUAL STACK FLOW RATE	91743088.	ACFM	2597889.	ACMH
ISO	PERCENT ISOKINETIC	98.8		98.8	
MA	FILTERABLE PART MG. EPA 5	69.6		69.6	
CS	FILTERABLE PART	.0096	GR/DSCF*	22.038	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	92.380	LB/HR	41.90	KG/HR
MA	SULFUR DIOXIDE MG. EPA 5	4080.0		4080.0	
CS	SULFUR DIOXIDE	.5644	GR/DSCF*	1291.908	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5415.374	LB/HR	2456.41	KG/HR
MA	SULFURIC ACID MG. EPA 5	71.7		71.7	
CS	SULFURIC ACID	.0099	GR/DSCF*	22.703	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	95.167	LB/HR	43.17	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 3DM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 114.939 * .986 * (29.19 + 3.158 / 13.6)}{(69. + 460.)} = 111.538 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 322. = 15.17 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 15.17}{111.538 + 15.17} = 11.97 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.0}{100.} = .880$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.60*44/100) + (6.1*32/100) + ((81.3+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26* (1. -(11.97/100)) + 18. * (11.97/100) = 28.79

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 392.244 / (SQRT(28.79 * 29.08) * 12. = 81.12 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 81.12 * 45239. 3600/144 = 91743088. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 91743088. * 29.08 * (1. - (11.97/100))}{(157. + 460.)} = 67152848. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(157.+460.))*((0.002669* 322.)+(114.939* .988*(29.14+(3.158/13.6))/(69.+460.)))}{120. * 81.12 * 29.08 * .220 * .220} = 98.84 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 69.6 * 15.43 / 111.538 = .0096 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0096 * 67152848. / (15.43 * 453.6) = 92.380

FIELD DATA

PLANT	MONO POWER PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	4AM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	DD	NOZZLE 2-03 : I.D.	.219
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.15	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	F84
FILTER NUMBER(S)	0002690	METER HEAD DIFF.	1.87
STACK INSIDE DIM.(IN)	240.00 .00		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.		HEATER BOX SETTING	320.
LEAKAGE	.002 CFM @ 9.0 IN.HG		
METER CALIB. FACTOR	1.037		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1328	523.858									
	10.0	0	533.520	2.000	3.57	3.57	159.	59.	59.	7.1	313.	53.
	20.0	0	543.320	2.100	3.75	3.75	159.	61.	58.	8.5	336.	52.
	30.0	0	553.000	2.000	3.59	3.59	158.	72.	59.	8.6	330.	96.
	40.0	0	562.810	2.000	3.58	3.58	165.	72.	62.	8.8	343.	125.
	50.0	0	572.810	2.100	3.77	3.77	165.	73.	64.	8.6	329.	99.
	60.0	0	582.880	2.200	3.95	3.95	166.	72.	63.	8.8	343.	76.
	70.0	0	592.930	2.200	3.94	3.94	169.	73.	63.	8.4	328.	63.
	80.0	0	603.000	2.200	3.96	3.96	166.	74.	63.	8.3	342.	57.
	90.0	0	612.880	2.100	3.78	3.78	166.	74.	64.	7.9	328.	52.
	100.0	0	622.800	2.100	3.78	3.78	168.	75.	65.	7.9	335.	48.
	110.0	0	632.940	2.200	3.95	3.95	169.	75.	65.	8.2	325.	47.
	120.0	1528	642.746	2.100	3.78	3.78	168.	76.	66.	7.8	331.	45.
TOTALS	120.0		118.888									
AVERAGE					3.78	3.78	165.	71.	63.	8.2	33c.	68.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONO POWER PLEASANTS

TEST TEAM LEADER

DO

TEST 4AM5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1328	1328
TF	TIME-FINISH	1528	1528
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.037	1.037
DN	SAMPLING NOZZLE DIAMETER	.219 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.78 IN-H2O	96.1 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	118.888 CU-FT	3.367 CU-M
TM	AVERAGE GAS METER TEMP	67.0 F	19.4 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	121.500 SCF	3.440 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	295.7	295.7
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	13.919 SCF	.394 SCM
BWO	PERCENT MOISTURE BY VOLUME	10.28	10.28
FMO	MOLE FRACTION DRY GAS	.897	.897
PCO2	PERCENT CO2 BY VOL., DRY	12.90	12.90
PO2	PERCENT O2 BY VOL., DRY	5.80	5.80
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.30	81.30
MD	MOLECULAR WT-DRY STACK GAS	30.30	30.30
MWS	MOLECULAR WT-STACK GAS	29.03	29.03

PB	BAROMETRIC PRESSURE	29.15	IN-HG	740.41	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.04	IN-HG	737.61	MM-HG
TS	AVERAGE STACK TEMP	165.	F	74.	C
VS	AVG STACK GAS VELOCITY	89.8	FPS	27.4	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	74696896.	SCFM	2115192.	SCMM
QS	ACTUAL STACK FLOW RATE	101509312.	ACFM	2874440.	ACMM
ISO	PERCENT ISOKINETIC	97.7		97.7	
MN	FILTERABLE PART MG. EPA 5	26.7		26.7	
CS	FILTERABLE PART	.0034	GR/DSCF*	7.761	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	36.188	LB/HR	16.41	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4350.0		4350.0	
CS	SULFUR DIOXIDE	.5524	GR/DSCF*	1264.472	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5895.818	LB/HR	2674.34	KG/HR
MN	SULFURIC ACID MG. EPA 5	28.3		28.3	
CS	SULFURIC ACID	.0036	GR/DSCF*	8.226	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	38.357	LB/HR	17.40	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 4AM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 118.888 * 1.037 * (29.15 + 5.783 / 13.6)}{(67. + 460.)} = 121.500 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 296. = 13.92 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 13.92}{121.500 + 13.92} = 10.28 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 10.3}{100.} = .897$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.90*44/100) + (5.8*32/100) + ((81.3+ .0) * 28/100 = 30.30

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.30* (1. -(10.28/100)) + 18. * (10.28/100) = 29.05

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 435.488 / (SQRT(29.03 * 29.04) * 12. = 89.75 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 89.75 * 45239. 3600/144 = 101509312. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 101509312. * 29.04 * (1. - (10.28/100))}{(165. + 460.)} = 74696896. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DA)

$$ISO = \frac{(305.58*(165.+460.))*((0.002669* 296.)+(116.888*1.037*(29.15+(3.783/13.6))/(67.+460.)))}{120. * 89.75 * 29.04 * .219 * .219} = 97.68 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 26.7 * 15.43 / 121.500 = .0034 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PHR = CS * QSSTD / (15.43 * 453.6)

PHR = .0034 * 74696896. / (15.43 * 453.6) = 36.168

FIELD DATA

PLANT	MORO POWER-PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	48M5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	DD	NOZZLE 2-01 : I.D.	.220
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.15	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FBB
FILTER NUMBER(S)	0002692	METER HEAD DIFF.	1.90
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	320.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.			
LEAKAGE	.010 CFM @ 7.0 IN.HG		
METER CALIB. FACTOR	.998		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1329	242.256									
	10.0	0	252.140	2.000	3.57	3.57	159.	57.	55.	5.7	343.	43.
	20.0	0	262.230	2.100	3.75	3.75	159.	60.	55.	6.7	332.	52.
	30.0	0	272.100	2.000	3.59	3.59	158.	65.	56.	6.8	331.	72.
	40.0	0	281.910	2.000	3.58	3.58	165.	69.	59.	6.7	327.	124.
	50.0	0	291.970	2.100	3.77	3.77	165.	71.	60.	6.8	328.	102.
	60.0	0	302.190	2.200	3.95	3.95	166.	72.	61.	6.9	340.	77.
	70.0	0	312.500	2.200	3.94	3.94	169.	72.	61.	6.8	342.	61.
	80.0	0	322.890	2.200	3.96	3.96	166.	73.	62.	6.8	342.	54.
	90.0	0	333.080	2.100	3.78	3.78	166.	73.	63.	6.5	338.	49.
	100.0	0	343.290	2.100	3.78	3.78	168.	74.	64.	6.5	332.	48.
	110.0	0	353.680	2.200	3.95	3.95	169.	74.	64.	6.7	328.	47.
	120.0	1529	363.819	2.100	3.78	3.78	168.	74.	65.	6.6	334.	47.
TOTALS	120.0		121.563									
AVERAGE					3.78	3.78	165.	70.	60.	6.6	335.	65.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONO POWER-PLEASANTS | DD

TEST 48H58 UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1329	1329
TF	TIME-FINISH	1529	1529
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.998	.998
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.78 IN-H2O	96.1 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	121.563 CU-FT	3.442 CU-M
TM	AVERAGE GAS METER TEMP	65.0 F	18.3 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	120.017 SCF	3.398 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	297.5	297.5
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	14.003 SCF	.397 SCM
BWO	PERCENT MOISTURE BY VOLUME	10.45	10.45
FMO	MOLE FRACTION DRY GAS	.896	.896
PCO2	PERCENT CO2 BY VOL., DRY	12.90	12.90
PO2	PERCENT O2 BY VOL., DRY	5.80	5.80
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.30	81.30
MD	MOLECULAR WT-DRY STACK GAS	30.30	30.30
MWS	MOLECULAR WT-STACK GAS	29.01	29.01

PB	BAROMETRIC PRESSURE	29.15	IN-HG	740.41	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.04	IN-HG	737.61	MM-HG
TS	AVERAGE STACK TEMP	165.	F	74.	C
VS	AVG STACK GAS VELOCITY	89.6	FPS	27.4	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	74581920.	SCFM	2111937.	SCMM
QS	ACTUAL STACK FLOW RATE	101545968.	ACFM	2875477.	ACMM
ISO	PERCENT ISOKINETIC	95.8		95.8	
MN	FILTERABLE PART MG. EPA 5	26.7		26.7	
CS	FILTERABLE PART	.0034 GR/DSCF*		7.857 MG/DSCM	
PMR	FILTERABLE PART EMISSION RATE	36.579 LB/HR		16.59 KG/HR	
MN	SULFUR DIOXIDE MG. EPA 5	4360.0		4360.0	
CS	SULFUR DIOXIDE	.5605 GR/DSCF*		1283.038 MG/DSCM	
PMR	SULFUR DIOXIDE EMISSION RATE	5973.179 LB/HR		2709.43 KG/HR	
MN	SULFURIC ACID MG. EPA 5	98.5		98.5	
CS	SULFURIC ACID	.0127 GR/DSCF*		28.986 MG/DSCM	
PMR	SULFURIC ACID EMISSION RATE	134.945 LB/HR		61.21 KG/HR	

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 48PSB

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 121.563 * .998 * (29.15 + 5.783 / 13.6)}{(65. + 460.)} = 120.017 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 298. = 14.00 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 14.00}{120.017 + 14.00} = 10.45 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 10.4}{100.} = .896$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.90*44/100) + (5.8*32/100) + ((81.3+ .0) * 28/100 = 30.30

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.30* (1. -(10.45/100)) + 18. * (10.45/100) = 29.01

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 435.488 / (SQRT(29.01 * 29.04) * 12. = 89.79 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 89.79 * 45239. 3600/144 = 101545968. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 101545968. * 29.04 * (1. - (10.45/100))}{(165. + 460.)} = 74581920. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(165.+460.))*((0.002669* 298.)+(121.563* .998*(29.15+(3.783/13.6))/(65.+460.)))}{120. * 89.79 * 29.04 * .220 * .220} = 95.76 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 26.7 * 15.43 / 120.017 = .0034 GM/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0034 * 74581920. / (15.43 * 453.6) = 36.579

FIELD DATA

PLANT	MONGO POWER PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	4CM58P
SAMPLE TYPE	M58P400	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	CLARKE	NOZZLE 2-02: I.D.	.219
AMBIENT TEMP.(DEG.F)	56.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.19	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	983
FILTER NUMBER(S)	0002691	METER HEAD DIFF.	2.00
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	400.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.008 CFM @ 7.5 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	1.006		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1330	493.363									
	10.0	1340	503.136	2.000	3.80	3.80	159.	62.	62.	7.5	325.	40.
	20.0	1350	513.200	2.100	3.80	3.80	159.	65.	61.	7.0	330.	39.
	30.0	1400	523.664	2.000	3.60	3.70	158.	75.	61.	7.0	336.	40.
	40.0	1410	533.136	2.000	3.60	3.60	165.	78.	62.	7.0	318.	44.
	50.0	1420	543.765	2.100	3.82	3.80	165.	80.	62.	7.0	325.	46.
	60.0	1430	553.725	2.200	4.00	4.00	166.	82.	63.	7.5	313.	44.
	70.0	1440	563.895	2.200	4.00	4.00	169.	84.	64.	7.5	319.	48.
	80.0	1450	574.280	2.200	4.00	4.00	166.	85.	64.	7.5	326.	48.
	90.0	1500	584.813	2.100	3.84	3.80	166.	85.	65.	7.0	314.	52.
	100.0	1510	594.436	2.100	3.85	3.90	168.	86.	69.	7.0	316.	50.
	110.0	1520	604.555	2.200	4.00	4.00	169.	86.	69.	7.5	324.	56.
	120.0	1530	615.114	2.100	3.85	3.90	168.	88.	70.	7.5	321.	50.
TOTALS	120.0		121.751									
AVERAGE					3.83	3.84	165.	80.	64.	7.3	322.	46.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONGO POWER PLEASANTS

TEST TEAM LEADER

CLARKE

TEST 4CM58P UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1330	1330
TF	TIME-FINISH	1530	1530
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.006	1.006
DN	SAMPLING NOZZLE DIAMETER	.219 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.84 IN-H2O	97.6 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	121.751 CU-FT	3.448 CU-M
TM	AVERAGE GAS METER TEMP	72.0 F	22.2 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	119.742 SCF	3.391 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	375.6	375.6
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	17.679 SCF	.501 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.87	12.87
FMD	MOLE FRACTION DRY GAS	.871	.871
PCO2	PERCENT CO2 BY VOL., DRY	12.90	12.90
PO2	PERCENT O2 BY VOL., DRY	5.80	5.80
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.30	81.30
MD	MOLECULAR WT-DRY STACK GAS	30.30	30.30
MWS	MOLECULAR WT-STACK GAS	28.71	28.71

PB	BAROMETRIC PRESSURE	29.19	IN-HG	741.43	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.08	IN-HG	738.62	MM-HG
TS	AVERAGE STACK TEMP	165.	F	74.	C
VS	AVG STACK GAS VELOCITY	90.2	FPS	27.5	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	72994096.	SCFH	2066974.	SCMH
QS	ACTUAL STACK FLOW RATE	101999792.	ACFH	2888328.	ACMH
ISO	PERCENT ISOKINETIC	98.5		98.5	
MN	FILTERABLE PART MG. EPA 5	40.8		40.8	
CS	FILTERABLE PART	.0053	GR/DSCF*	12.034	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	54.831	LB/HR	24.87	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4380.0		4380.0	
CS	SULFUR DIOXIDE	.5644	GR/DSCF*	1291.880	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5886.300	LB/HR	2670.03	KG/HR
MN	SULFURIC ACID MG. EPA 5	107.0		107.0	
CS	SULFURIC ACID	.0138	GR/DSCF*	31.560	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	143.798	LB/HR	65.23	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.4CM5UP

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 121.751 * 1.006 * (29.19 + 3.842 / 13.6)}{(72. + 460.)} = 119.742 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 376. = 17.68 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 17.68}{119.742 + 17.68} = 12.87 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.9}{100.} = .871$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.90*44/100) + (5.8*32/100) + ((81.3+ .0) * 28/100 = 30.30

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.30* (1. -(12.87/100)) + 18. * (12.87/100) = 28.71

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 435.488 / (SQRT(28.71 * 29.08) * 12. = 90.19 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 90.19 * 45239. 3600/144 = 101999792. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 101999792. * 29.08 * (1. - (12.87/100))}{(165. + 460.)} = 72994096.\ SCFM$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DA)

$$ISO = \frac{(305.58*(165.+460.))*((0.002669* 376.)+(121.751*1.006*(29.19+(3.842/13.6))/(72.+460.)))}{120. * 90.19 * 29.08 * .219 * .219} = 98.51\ PERCENT$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 40.8 * 15.43 / 119.742 = .0053 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0053 * 72994096. / (15.43 * 453.6) = 54.831

FIELD DATA

PLANT	MORGO POWER PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	4DM5BP
SAMPLE TYPE	M5B-P400	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	CLARKE	NOZZLE 2-07: 1.0.	.221
AMBIENT TEMP.(DEG.F)	56.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.19	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	F85
FILTER NUMBER(S)	0002093	METER HEAD DIFF.	1.95
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	400.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.000 CFM @ 9.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	.988		
READ & RECORD DATA EVERY 10.0 MINUTES			

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1330	192.382									
	10.0	1340	201.736	2.000	3.69	3.60	159.	66.	66.	4.5	335.	40.
	20.0	1350	211.900	2.100	3.80	3.80	159.	68.	67.	7.0	335.	36.
	30.0	1400	223.415	2.000	3.65	3.70	158.	67.	67.	7.5	334.	40.
	40.0	1410	233.037	2.000	3.66	3.70	165.	82.	67.	7.5	324.	44.
	50.0	1420	244.271	2.100	3.86	3.90	165.	85.	68.	7.5	316.	48.
	60.0	1430	254.835	2.200	4.05	4.10	166.	87.	69.	8.0	318.	50.
	70.0	1440	265.900	2.200	4.03	4.00	169.	87.	70.	8.0	335.	49.
	80.0	1450	276.375	2.200	4.06	4.70	166.	88.	72.	8.0	324.	54.
	90.0	1500	287.720	2.100	3.88	3.90	166.	88.	72.	8.0	319.	58.
	100.0	1510	298.325	2.100	3.88	3.90	168.	90.	74.	8.0	326.	52.
	110.0	1520	309.110	2.200	4.06	4.10	169.	90.	74.	8.0	319.	50.
	120.0	1530	319.624	2.100	3.88	3.90	168.	90.	75.	8.0	326.	50.
TOTALS	120.0		127.242									
AVERAGE					3.87	3.94	165.	82.	70.	7.5	326.	48.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONGO POWER PLEASANTS

TEST LEADER

CLARKE

TEST 40M58P UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1330	1330
TF	TIME-FINISH	1530	1530
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.988	.988
DN	SAMPLING NOZZLE DIAMETER	.221 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.94 IN-H2O	100.1 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	127.242 CU-FT	3.603 CU-M
TM	AVERAGE GAS METER TEMP	76.2 F	24.6 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	121.969 SCF	3.454 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	367.7	367.7
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	17.308 SCF	.490 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.43	12.43
FMO	MOLE FRACTION DRY GAS	.876	.876
PCO2	PERCENT CO2 BY VOL., DRY	12.90	12.90
PO2	PERCENT O2 BY VOL., DRY	5.80	5.80
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.30	81.30
MD	MOLECULAR WT-DRY STACK GAS	30.30	30.30
MWS	MOLECULAR WT-STACK GAS	28.77	28.77

PB	BAROMETRIC PRESSURE	29.19	IN-HG	741.43	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.08	IN-HG	738.62	MM-HG
TS	AVERAGE STACK TEMP	165.	F	74.	C
VS	AVG STACK GAS VELOCITY	90.1	FPS	27.5	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	73292528.	SCFH	2075425.	SCMH
QS	ACTUAL STACK FLOW RATE	101904160.	ACFH	2885620.	ACMH
ISO	PERCENT ISOKINETIC	98.1		98.1	
MN	FILTERABLE PART MG. EPA 5	27.2		27.2	
CS	FILTERABLE PART	.0034	GR/DSCF*	7.876	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	36.033	LB/HR	16.34	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4340.0		4340.0	
CS	SULFUR DIOXIDE	.5490	GR/DSCF*	1256.709	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5749.456	LB/HR	2607.95	KG/HR
MN	SULFURIC ACID MG. EPA 5	105.0		105.0	
CS	SULFURIC ACID	.0133	GR/DSCF*	30.404	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	139.100	LB/HR	63.10	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.40M5BP

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 127.242 * .988 * (29.19 + 5.942 / 13.6)}{(76. + 460.)} = 121.969 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 368. = 17.31 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 17.31}{121.969 + 17.31} = 12.43 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.4}{100.} = .876$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.90*44/100) + (5.8*32/100) + ((81.3+ .0) * 28/100 = 30.30

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.30* (1. -(12.43/100)) + 18. * (12.43/100) = 28.77

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 435.486 / (SQRT(28.77 * 29.08) * 12. = 90.10 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 90.10 * 45239. 3600/144 = 101904160. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 101904160. * 29.08 * (1. - (12.43/100))}{(165. + 460.)} = 73292528. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(165.+460.))*((0.002669*368.)+(127.242*.988*(29.19+(3.942/13.6))/(76.+460.)))}{120. * 90.10 * 29.08 * .221 * .221} = 98.14 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 27.2 * 15.43 / 121.969 = .0034 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0034 * 73292528. / (15.43 * 453.6) = 36.033

FIELD DATA

PLANT	MUNO POWER-PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	SAM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	DD	NOZZLE 2-11 : 1.0,	.222
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.15	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB4
FILTER NUMBER(S)	0002694	METER HEAD DIFF.	1.87
STACK INSIDE DIM.(IN)	240.00 .00		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.		HEATER BOX SETTING	320.
LEAKAGE	.008 CFM @ 10.0 IN.HG		
METER CALIB. FACTOR	1.037		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1636	643.067									
	10.0	0	652.820	2.000	3.67	3.67	168.	62.	62.	8.7	322.	52.
	20.0	0	662.320	1.900	3.48	3.48	170.	64.	62.	9.2	335.	48.
	30.0	0	672.130	1.900	3.51	3.51	169.	74.	63.	9.0	321.	106.
	40.0	0	681.670	1.900	3.51	3.51	169.	70.	64.	8.1	319.	102.
	50.0	0	691.240	1.900	3.51	3.51	169.	72.	65.	8.2	334.	76.
	60.0	0	700.880	1.900	3.53	3.53	168.	74.	64.	8.2	338.	61.
	70.0	0	710.530	1.900	3.53	3.53	169.	75.	65.	7.9	322.	54.
	80.0	0	720.240	1.900	3.54	3.54	167.	76.	65.	7.8	325.	50.
	90.0	0	730.070	2.000	3.73	3.73	169.	76.	66.	8.2	336.	48.
	100.0	0	739.750	1.900	3.54	3.54	169.	76.	67.	7.8	337.	47.
	110.0	0	749.430	1.900	3.55	3.55	167.	76.	67.	7.7	321.	48.
	120.0	1836	759.021	1.900	3.53	3.53	170.	76.	67.	7.7	331.	48.
TOTALS	120.0		115.954									
AVERAGE					3.55	3.55	169.	73.	65.	8.2	328.	62.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MONO POWER-PLEASANTS — DD

TEST SAMSB UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1636	1636
TF	TIME-FINISH	1836	1836
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.037	1.037
DN	SAMPLING NOZZLE DIAMETER	.222 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.55 IN-H2O	90.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	115.954 CU-FT	3.283 CU-M
TM	AVERAGE GAS METER TEMP	68.6 F	20.3 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	116.069 SCF	3.343 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	316.0	316.0
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	14.874 SCF	.421 SCM
BWO	PERCENT MOISTURE BY VOLUME	11.19	11.19
FMO	MOLE FRACTION DRY GAS	.888	.888
PCO2	PERCENT CO2 BY VOL., DRY	11.90	11.90
PO2	PERCENT O2 BY VOL., DRY	6.80	6.80
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.30	81.30
MD	MOLECULAR WT-DRY STACK GAS	30.18	30.18
MWS	MOLECULAR WT-STACK GAS	28.81	28.81

PB	BAROMETRIC PRESSURE	29.15	IN-HG	740.41	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.04	IN-HG	737.61	MM-HG
TS	AVERAGE STACK TEMP	169.	F	76.	C
VS	AVG STACK GAS VELOCITY	86.2	FPS	26.3	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	70554832.	SCFH	1997901.	SCMH
QS	ACTUAL STACK FLOW RATE	97457232.	ACFH	2759697.	ACMH
ISO	PERCENT ISOKINETIC	97.8		97.8	
MN	FILTERABLE PART MG. EPA 5	47.6		47.6	
CS	FILTERABLE PART	.0062	GR/DSCF*	14.239	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	62.708	LB/HR	28.44	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4540.0		4540.0	
CS	SULFUR DIOXIDE	.5933	GR/DSCF*	1358.050	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5981.015	LB/HR	2712.99	KG/HR
MN	SULFURIC ACID MG. EPA 5	73.8		73.8	
CS	SULFURIC ACID	.0096	GR/DSCF*	22.076	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	97.224	LB/HR	44.10	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. SAM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 115.954 * 1.037 * (29.15 + 3.553 / 13.6)}{(69. + 460.)} = 118.069 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 316. = 14.87 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 14.87}{118.069 + 14.87} = 11.19 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 11.2}{100.} = .888$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (11.90*44/100) + (6.8*32/100) + (81.3+ .0) * 28/100 = 30.18

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.18* (1. -(11.19/100)) + 18. * (11.19/100) = 28.81

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 416.526 / (SQRT(28.81 * 29.04) * 12. = 86.17 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 86.17 * 45239. 3600/144 = 97457232. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 97457232. * 29.04 * (1. - (11.19/100))}{(169. + 460.)} = 70554832. \text{ SCFM}$$

PERCENT ISOKINETIC

ISC = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(169.+460.))*((0.002669* 316.)+(115.954*1.037*(29.15+(3.553/13.6))/(69.+460.)))}{120. * 86.17 * 29.04 * .222 * .222} = 97.80 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 47.6 * 15.43 / 118.069 = .0062 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0062 * 70554832. / (15.43 * 453.6) = 62.708

FIELD DATA

PLANT	MUNO POWER-PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	58M58
SAMPLE TYPE	M58	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	DD	NOZZLE #-ID : I.D.	.221
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.15	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB8
FILTER NUMBER(S)	0002695	METER HEAD DIFF.	1.90
STACK INSIDE DIM.(IN)	240.00 .00		
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.		HEATER BOX SETTING	320.
LEAKAGE	.014 CFM @ 9.0 IN.HG		
METER CALIB. FACTOR	.998		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1637	364.038									
	10.0	0	373.990	2.000	3.67	3.67	168.	61.	60.	8.6	308.	53.
	20.0	0	383.810	1.900	3.48	3.48	170.	62.	60.	8.8	335.	48.
	30.0	0	393.750	1.900	3.51	3.51	169.	65.	59.	9.0	335.	56.
	40.0	0	403.660	1.900	3.51	3.51	169.	69.	61.	8.7	337.	102.
	50.0	0	413.580	1.900	3.51	3.51	169.	70.	61.	8.7	334.	86.
	60.0	0	423.600	1.900	3.53	3.53	168.	71.	62.	8.7	336.	81.
	70.0	0	433.560	1.900	3.53	3.53	169.	71.	62.	8.5	330.	73.
	80.0	0	443.600	1.900	3.54	3.54	167.	72.	63.	8.4	330.	61.
	90.0	0	453.710	2.000	3.73	3.73	169.	72.	63.	8.8	328.	57.
	100.0	0	463.660	1.900	3.54	3.54	169.	72.	64.	8.6	328.	56.
	110.0	0	473.580	1.900	3.55	3.55	167.	73.	64.	8.5	324.	54.
	120.0	1637	483.433	1.900	3.53	3.53	170.	73.	64.	8.6	324.	54.
TOTALS	120.0		119.395									
AVERAGE					3.55	3.55	169.	69.	62.	8.7	329.	65.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MONO POWER-PLEASANTS — DU

TEST 58M58 UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1637	1637
TF	TIME-FINISH	1837	1837
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.998	.998
DN	SAMPLING NOZZLE DIAMETER	.221 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
DM	AVERAGE ORIFICE PRESSURE DROP	3.55 IN-H2O	90.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	119.395 CU-FT	3.381 CU-M
TM	AVERAGE GAS METER TEMP	65.6 F	18.7 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	117.668 SCF	3.332 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	310.9	310.9
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	14.634 SCF	.414 SCM
BWO	PERCENT MOISTURE BY VOLUME	11.06	11.06
FMD	MOLE FRACTION DRY GAS	.889	.889
PCO2	PERCENT CO2 BY VOL., DRY	11.90	11.90
PO2	PERCENT O2 BY VOL., DRY	6.80	6.80
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.30	81.30
MD	MOLECULAR WT-DRY STACK GAS	30.18	30.18
MWS	MOLECULAR WT-STACK GAS	28.83	28.83

PB	BAROMETRIC PRESSURE	29.15	IN-HG	740.41 MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10 MM-H2O
PS	STACK PRES, ABS.	29.04	IN-HG	737.61 MM-HG
TS	AVERAGE STACK TEMP	169.	F	76. C
VS	AVG STACK GAS VELOCITY	86.1	FPS	26.3 MPS
AS	STACK AREA	45239.	SQ-IN	29.186 SQ-M
QSSTD	STACK FLOW RATE, DRY*	70636912.	SCFH	2000226. SCMH
QS	ACTUAL STACK FLOW RATE	97431008.	ACFH	2758954. ACMH
ISO	PERCENT ISOKINETIC	98.2		98.2
MN	FILTERABLE PART MG. EPA 5	46.2		46.2
CS	FILTERABLE PART	.0061	GR/DSCF*	13.867 MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	61.142	LB/HR	27.73 KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4420.0		4420.0
CS	SULFUR DIOXIDE	.5796	GR/DSCF*	1326.656 MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5849.546	LB/HR	2653.35 KG/HR
MN	SULFURIC ACID MG. EPA 5	84.4		84.4
CS	SULFURIC ACID	.0111	GR/DSCF*	25.533 MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	111.697	LB/HR	50.67 KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 58P58

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 119.395 * .998 * (29.15 + 3.553 / 13.6)}{(66. + 460.)} = 117.666 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 311. = 14.63 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 14.63}{117.666 + 14.63} = 11.06 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 11.1}{100.} = .889$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (11.90*44/100) + (6.8*32/100) + ((81.3+ .0) * 28/100 = 30.18

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.18* (1. -(11.06/100)) + 18. * (11.06/100) = 28.83

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 416.528 / (SQRT(28.83 * 29.04) * 12. = 86.15 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 86.15 * 45239. 3600/144 = 97431008. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 97431008. * 29.04 * (1. - (11.06/100))}{(169. + 460.)} = 70636912. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(169.+460.))*((0.002669* 311.)+(119.395* .998*(29.15+(3.553/13.6))/(66.+460.)))}{120. * 86.15 * 29.04 * .221 * .221} = 98.24 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 46.2 * 15.43 / 117.668 = .0061 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0061 * 70636912. / (15.43 * 453.6) = 61.142

FIELD DATA

PLANT	MONGO POWER PLEASANTS	DATE	11/31/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	SCMSB
SAMPLE TYPE	MSB	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	CLARKE	NOZZLE 2-09: I.D.	.220
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.19	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	F83
FILTER NUMBER(S)	0002696	METER HEAD DIFF.	2.00
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	125	HEATER BOX SETTING	320.
LEAKAGE	.040 CFM @ 3.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	1.006		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1636	615.322									
	10.0	1646	624.170	2.000	3.58	3.60	168.	66.	66.	8.5	324.	50.
	20.0	1656	633.200	1.900	3.40	3.40	170.	68.	65.	9.0	327.	42.
	30.0	1706	644.550	1.900	3.40	3.40	169.	74.	64.	9.5	329.	85.
	40.0	1716	653.000	1.900	3.44	3.40	168.	80.	65.	10.0	319.	84.
	50.0	1726	663.626	1.900	3.45	3.50	169.	82.	65.	9.0	313.	60.
	60.0	1736	673.820	1.900	3.46	3.50	168.	84.	66.	9.0	315.	54.
	70.0	1746	683.520	1.900	3.46	3.50	169.	85.	66.	9.0	316.	50.
	80.0	1756	692.500	1.900	3.50	3.50	167.	85.	67.	9.5	315.	48.
	90.0	1806	702.723	2.000	3.65	3.70	169.	86.	67.	10.0	316.	48.
	100.0	1816	711.630	1.900	3.50	3.50	169.	86.	68.	9.5	315.	46.
	110.0	1826	721.235	1.900	3.50	3.50	167.	86.	68.	9.5	315.	44.
	120.0	1836	732.436	1.900	3.47	3.50	170.	87.	68.	9.5	319.	46.
TOTALS	120.0		117.114									
AVERAGE					3.48	3.50	169.	81.	66.	9.3	319.	55.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONGU POWER PLEASANTS

TEST TEAM LEADER

CLARKE

TEST 5CM58 UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/31/82	11/31/82
TB	TIME-START	1636	1636
TF	TIME-FINISH	1836	1836
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.006	1.006
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.50 IN-H2O	88.9 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	117.114 CU-FT	3.316 CU-M
TM	AVERAGE GAS METER TEMP	73.5 F	23.1 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	114.760 SCF	3.250 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	522.2	522.2
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	15.160 SCF	.429 SCM
BWO	PERCENT MOISTURE BY VOLUME	11.67	11.67
FMO	MOLE FRACTION DRY GAS	.883	.883
PCO2	PERCENT CO2 BY VOL., DRY	11.90	11.90
PO2	PERCENT O2 BY VOL., DRY	6.80	6.80
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.30	81.30
MD	MOLECULAR WT-DRY STACK GAS	30.18	30.18
MWS	MOLECULAR WT-STACK GAS	28.75	28.75

PB	BAROMETRIC PRESSURE	29.19	IN-HG	741.43	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.08	IN-HG	738.62	MM-HG
TS	AVERAGE STACK TEMP	169.	F	76.	C
VS	AVG STACK GAS VELOCITY	86.2	FPS	26.3	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	70294928.	SCFH	1990542.	SCMH
QS	ACTUAL STACK FLOW RATE	97483600.	ACFH	2760443.	ACMH
ISO	PERCENT ISOKINETIC	97.2		97.2	
MN	FILTERABLE PART MG. EPA 5	54.0		54.0	
CS	FILTERABLE PART	.0073	GR/DSCF*	16.619	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	72.921	LB/HR	33.08	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4420.0		4420.0	
CS	SULFUR DIOXIDE	.5943	GR/DSCF*	1360.277	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5968.753	LB/HR	2707.43	KG/HR
MN	SULFURIC ACID MG. EPA 5	134.0		134.0	
CS	SULFURIC ACID	.0180	GR/DSCF*	41.239	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	180.953	LB/HR	82.08	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. SCM58

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 117.114 * 1.006 * (29.19 + 3.500 / 13.6)}{(74. + 460.)} = 114.760 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 322. = 15.17 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 15.17}{114.760 + 15.17} = 11.67 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 11.7}{100.} = .883$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (11.90*44/100) + (6.8*32/100) + ((81.3+ .0) * 28/100 = 30.18

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.18* (1. -(11.67/100)) + 18. * (11.67/100) = 28.75

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 416.501 / (SQRT(28.75 * 29.08) * 12. = 86.19 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 86.19 * 45239. 3600/144 = 97483600. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 97483600. * 29.08 * (1. - (11.67/100))}{(169. + 460.)} = 70294928. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(169.+460.))*((0.002669* 322.)+(117.114*1.006*(29.19+(3.500/13.6))/(74.+460.)))}{120. * 86.19 * 29.08 * .220 * .220} = 97.15 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 54.0 * 15.43 / 114.760 = .0073 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PHR = CS * QSSTD / (15.43 * 453.6)

PHR = .0073 * 70294928. / (15.43 * 453.6) = 72.921

FIELD DATA

PLANT	MUNGO POWER PLEASANTS	DATE	11/30/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	5DM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	CLARKE	NOZZLE 2-12: I.D.	.220
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.19	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB5
FILTER NUMBER(S)	0002697	METER HEAD DIFF.	1.95
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	125	HEATER BOX SETTING	320.
LEAKAGE	.008 CFM @ 13.5 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	.988		
READ & RECORD DATA EVERY 10.0 MINUTES			

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1638	320.033									
	10.0	1648	329.500	2.000	3.60	3.60	168.	70.	70.	8.0	323.	50.
	20.0	1658	338.315	1.900	3.40	3.40	170.	71.	68.	9.0	329.	40.
	30.0	1708	351.273	1.900	3.45	3.50	169.	79.	68.	9.0	344.	74.
	40.0	1718	359.525	1.900	3.46	3.50	169.	83.	70.	9.0	335.	76.
	50.0	1728	369.998	1.900	3.48	3.50	169.	86.	70.	9.0	313.	58.
	60.0	1738	379.000	1.900	3.50	3.50	168.	87.	72.	10.0	314.	50.
	70.0	1748	387.915	1.900	3.50	3.50	169.	88.	72.	10.5	317.	50.
	80.0	1758	398.750	1.900	3.50	3.50	167.	88.	73.	12.0	321.	48.
	90.0	1808	408.860	2.000	3.70	3.70	169.	88.	74.	13.0	324.	46.
	100.0	1818	418.450	1.900	3.50	3.50	169.	88.	74.	13.5	317.	42.
	110.0	1828	428.700	1.900	3.50	3.50	167.	87.	74.	13.0	314.	42.
	120.0	1838	440.182	1.900	3.50	3.50	170.	87.	74.	13.5	319.	44.
TOTALS	120.0		120.149									
AVERAGE					3.51	3.52	169.	84.	72.	10.8	323.	52.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONGO POWER PLEASANTS | CLARKE

TEST 50M5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		11/30/82	11/30/82
TB	TIME-START	1638	1638
TF	TIME-FINISH	1838	1838
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.988	.988
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.52 IN-H2O	89.3 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	120.149 CU-FT	3.402 CU-M
TM	AVERAGE GAS METER TEMP	77.5 F	25.3 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	114.763 SCF	3.250 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	322.0	322.0
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	15.157 SCF	.429 SCM
BWO	PERCENT MOISTURE BY VOLUME	11.67	11.67
FMO	MOLE FRACTION DRY GAS	.883	.883
PCO2	PERCENT CO2 BY VOL., DRY	11.90	11.90
PO2	PERCENT O2 BY VOL., DRY	6.80	6.80
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.30	81.30
MD	MOLECULAR WT-DRY STACK GAS	30.18	30.18
MWS	MOLECULAR WT-STACK GAS	28.76	28.76

PB	BAROMETRIC PRESSURE	29.19	IN-HG	741.43	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.08	IN-HG	738.62	MM-HG
TS	AVERAGE STACK TEMP	169.	F	76.	C
VS	AVG STACK GAS VELOCITY	86.2	FPS	26.3	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	7029456O.	SCFM	1990531.	SCMM
QS	ACTUAL STACK FLOW RATE	97488624.	ACFM	2760586.	ACMM
ISO	PERCENT ISOKINETIC	97.2		97.2	
MN	FILTERABLE PART MG. EPA 5	48.2		48.2	
CS	FILTERABLE PART	.0065	GR/DSCF*	14.833	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	65.087	LB/HR	29.52	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4400.0		4400.0	
CS	SULFUR DIOXIDE	.5916	GR/DSCF*	1354.089	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5941.570	LB/HR	2695.10	KG/HR
MN	SULFURIC ACID MG. EPA 5	74.0		74.0	
CS	SULFURIC ACID	.0099	GR/DSCF*	22.773	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	99.926	LB/HR	45.33	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. SUM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 120.149 * .988 * (29.19 + 3.517 / 13.6)}{(78. + 460.)} = 114.763 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VwC = .04707 * VLC

VwC = .04707 * 322. = 15.16 SCF

PERCENT MOISTURE IN STACK GAS

BwO = (100. * VwC) / (VMSTD + VwC)

$$BwO = \frac{100. * 15.16}{114.763 + 15.16} = 11.67 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BwO) / 100.

$$FMD = \frac{100. - 11.7}{100.} = .883$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (11.90*44/100) + (6.8*32/100) + ((81.3+ .0) * 28/100 = 30.18

MOLECULAR WEIGHT OF STACK GAS

MwS = MD * (1. - (BwO/100)) + 18. * (BwO/100)

MwS = 30.18* (1. -(11.67/100)) + 18. * (11.67/100) = 28.76

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 416.528 / (SQRT(28.76 * 29.08) * 12. = 86.20 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 86.20 * 45239. 3600/144 = 97488624. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 97488624. * 29.08 * (1. - (11.67/100))}{(169. + 460.)} = 70294560.\ SCFM$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(169.+460.))*((0.002669* 322.)+(120.149* .988*(29.19+(3.517/13.6))/(78.+460.)))}{120. * 86.20 * 29.08 * .220 * .220} = 97.15\ PERCENT$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 48.2 * 15.43 / 114.763 = .0065 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0065 * 70294560. / (15.43 * 453.6) = 65.087

FIELD DATA

PLANT	MONO POWER-PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	6AM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	DD	NOZZLE 2-03 : 1.0.	.219
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.18	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB4
FILTER NUMBER(S)	0002698	METER HEAD DIFF.	1.87
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	320.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.			
LEAKAGE	.002 CFM @ 6.0 IN.HG		
METER CALIB. FACTOR	1.037		
READ & RECORD DATA EVERY 10.0 MINUTES			

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	941	759.748									
	10.0	0	769.060	1.900	3.37	3.37	158.	57.	56.	5.3	321.	42.
	20.0	0	777.940	1.700	3.02	3.02	159.	60.	56.	5.5	337.	40.
	30.0	0	786.900	1.700	3.03	3.03	161.	66.	57.	5.4	325.	59.
	40.0	0	795.680	1.600	2.88	2.88	160.	70.	59.	5.0	335.	59.
	50.0	0	804.680	1.700	3.05	3.05	163.	72.	60.	5.2	339.	57.
	60.0	0	813.660	1.700	3.07	3.07	160.	73.	62.	5.2	330.	58.
	70.0	0	822.770	1.700	3.09	3.09	159.	74.	63.	5.2	320.	57.
	80.0	0	832.060	1.800	3.27	3.27	160.	74.	64.	5.6	332.	54.
	90.0	0	841.550	1.900	3.43	3.43	164.	75.	65.	5.8	339.	52.
	100.0	0	850.860	1.800	3.27	3.27	162.	76.	65.	5.7	335.	52.
	110.0	0	860.190	1.800	3.28	3.28	160.	76.	66.	5.8	323.	51.
	120.0	1141	869.461	1.800	3.26	3.26	164.	76.	66.	5.7	331.	50.
TOTALS	120.0		109.713									
AVERAGE					3.17	3.17	161.	71.	62.	5.5	331.	53.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MONO POWER-PLEASANTS — DD

TEST 6AM5B UNIT 1

		ENGLISH UNITS		METRIC UNITS	
TEST DATE		12/01/82		12/01/82	
TB	TIME-START	941		941	
TF	TIME-FINISH	1141		1141	
TT	NET TIME OF TEST, MIN.	120.0		120.0	
NP	NET SAMPLING POINTS	12		12	
Y	METER CALIBRATION FACTOR	1.037		1.037	
DN	SAMPLING NOZZLE DIAMETER	.219	IN	5.6	MM
CP	PITOT TUBE COEFFICIENT	.84		.84	
PM	AVERAGE ORIFICE PRESSURE DROP	3.17	IN-H2O	80.5	MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	109.715	CU-FT	3.107	CU-M
TM	AVERAGE GAS METER TEMP	66.2	F	19.0	C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	112.234	SCF	3.178	SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	339.4		339.4	
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	15.976	SCF	.452	SCM
BWO	PERCENT MOISTURE BY VOLUME	12.46		12.46	
FMO	MOLE FRACTION DRY GAS	.875		.875	
PCO2	PERCENT CO2 BY VOL., DRY	12.87		12.87	
PO2	PERCENT O2 BY VOL., DRY	5.60		5.60	
PCO	PERCENT CO BY VOL., DRY	.00		.00	
PN2	PERCENT N2 BY VOL., DRY	81.53		81.53	
MD	MOLECULAR WT-DRY STACK GAS	30.28		30.28	
MWS	MOLECULAR WT-STACK GAS	28.75		28.75	

PB	BAROMETRIC PRESSURE	29.18	IN-HG	741.17	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.07	IN-HG	738.37	MM-HG
TS	AVERAGE STACK TEMP	161.	F	72.	C
VS	AVG STACK GAS VELOCITY	82.0	FPS	25.0	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	67117952.	SCFH	1900579.	SCMH
QS	ACTUAL STACK FLOW RATE	92789376.	ACFH	2627517.	ACMH
ISO	PERCENT ISOKINETIC	100.4		100.4	
MA	FILTERABLE PART MG. EPA 5	33.6		33.6	
CS	FILTERABLE PART	.0046	GR/DSCF*	10.573	MG/DSCM
PMH	FILTERABLE PART EMISSION RATE	44.298	LB/HR	20.09	KG/HR
MA	SULFUR DIOXIDE MG. EPA 5	3950.0		3950.0	
CS	SULFUR DIOXIDE	.5430	GR/DSCF*	1242.992	MG/DSCM
PMH	SULFUR DIOXIDE EMISSION RATE	5207.622	LB/HR	2362.18	KG/HR
MA	SULFURIC ACID MG. EPA 5	74.3		74.3	
CS	SULFURIC ACID	.0102	GR/DSCF*	23.381	MG/DSCM
PMH	SULFURIC ACID EMISSION RATE	97.956	LB/HR	44.43	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 6AM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 109.713 * 1.037 * (29.18 + 3.168 / 13.6)}{(66. + 460.)} = 112.234 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 339. = 15.98 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 15.98}{112.234 + 15.98} = 12.46 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.5}{100.} = .875$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.87*44/100) + (5.6*32/100) + ((81.5+ .0) * 28/100 = 30.28

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.28* (1. -(12.46/100)) + 18. * (12.46/100) = 28.75

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 396.362 / (SQRT(28.75 * 29.07) * 12. = 82.04 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 82.04 * 45239. 3600/144 = 92789376. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 92789376. * 29.07 * (1. - (12.46/100))}{(161. + 460.)} = 67117952. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(161.+460.))*((0.002669* 339.)+(109.715*1.037*(29.18+(3.168/13.6))/(66.+460.)))}{120. * 82.04 * 29.07 * .219 * .219} = 100.42 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 53.6 * 15.43 / 112.234 = .0046 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0046 * 67117952. / (15.43 * 453.6) = 44.298

FIELD DATA

PLANT	MORO POWER-PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	68M5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	DD	NOZZLE I.D.	.220
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.18	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB8
FILTER NUMBER(S)	0002699	METER HEAD DIFF.	1.90
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	320.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.			
LEAKAGE	.006 CFM @ 8.0 IN.HG		
METER CALIB. FACTOR	.998		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	942	494.232									
	10.0	0	503.690	1.900	3.37	3.37	158.	54.	52.	7.1	325.	49.
	20.0	0	512.910	1.700	3.02	3.02	159.	57.	52.	7.4	323.	45.
	30.0	0	522.140	1.700	3.03	3.03	161.	61.	53.	6.8	335.	59.
	40.0	0	531.190	1.600	2.88	2.88	160.	66.	55.	6.4	334.	58.
	50.0	0	540.450	1.700	3.05	3.05	163.	68.	56.	6.6	337.	58.
	60.0	0	549.740	1.700	3.07	3.07	160.	70.	58.	6.5	328.	60.
	70.0	0	559.160	1.700	3.09	3.09	159.	71.	60.	6.6	325.	59.
	80.0	0	568.740	1.800	3.27	3.27	160.	72.	61.	6.8	325.	58.
	90.0	0	578.540	1.900	3.43	3.43	164.	73.	62.	7.2	322.	54.
	100.0	0	588.090	1.800	3.27	3.27	162.	73.	63.	6.9	331.	53.
	110.0	0	597.720	1.800	3.28	3.28	160.	73.	64.	7.0	327.	52.
	120.0	1142	607.315	1.800	3.26	3.26	164.	74.	64.	7.0	330.	52.
TOTALS	120.0		113.083									
AVERAGE					3.17	3.17	161.	68.	58.	6.9	329.	55.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONO POWER-PLEASANTS

TEST LEADER

DD

TEST 68M58 UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
TB	TIME-START	942	942
TF	TIME-FINISH	1142	1142
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.998	.998
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.17 IN-H2O	80.5 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	113.083 CU-FT	3.202 CU-M
TM	AVERAGE GAS METER TEMP	63.0 F	17.2 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	112.005 SCF	3.172 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	350.7	350.7
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	16.507 SCF	.467 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.85	12.85
FMO	MOLE FRACTION DRY GAS	.872	.872
PCO2	PERCENT CO2 BY VOL., DRY	12.87	12.87
PO2	PERCENT O2 BY VOL., DRY	5.60	5.60
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.53	81.53
MD	MOLECULAR WT-DRY STACK GAS	30.28	30.28
MWS	MOLECULAR WT-STACK GAS	28.71	28.71

PB	BAROMETRIC PRESSURE	29.18	IN-HG	741.17	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.07	IN-HG	738.37	MM-HG
TS	AVERAGE STACK TEMP	161.	F	72.	C
VS	AVG STACK GAS VELOCITY	82.1	FPS	25.0	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	6687896.	SCFM	1893787.	SCMM
QS	ACTUAL STACK FLOW RATE	92865712.	ACFM	2629679.	ACMM
ISO	PERCENT ISOKINETIC	99.7		99.7	
MN	FILTERABLE PART MG. EPA 5	33.8		33.8	
CS	FILTERABLE PART	.0047	GR/DSCF*	10.658	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	44.493	LB/HR	20.18	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	3910.0		3910.0	
CS	SULFUR DIOXIDE	.5387	GR/DSCF*	1232.923	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5146.974	LB/HR	2334.67	KG/HR
MN	SULFURIC ACID MG. EPA 5	114.0		114.0	
CS	SULFURIC ACID	.0157	GR/DSCF*	35.947	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	150.065	LB/HR	68.07	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 68PS8

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 113.083 * .996 * (29.18 + 5.168 / 13.6)}{(63. + 460.)} = 112.005 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VwC = .04707 * VLC

VwC = .04707 * 351. = 16.51 SCF

PERCENT MOISTURE IN STACK GAS

BwO = (100. * VwC) / (VMSTD + VwC)

$$BwO = \frac{100. * 16.51}{112.005 + 16.51} = 12.85 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BwO) / 100.

$$FMD = \frac{100. - 12.8}{100.} = .872$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.87*44/100) + (5.6*32/100) + ((81.5+ .0) * 28/100 = 30.28

MOLECULAR WEIGHT OF STACK GAS

MwS = MD * (1. - (BwO/100)) + 18. * (BwO/100)

MwS = 30.28* (1. -(12.85/100)) + 18. * (12.85/100) = 28.71

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 396.362 / (SQRT(28.71 * 29.07) * 12. = 82.11 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 82.11 * 45239. 3600/144 = 92865712. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 92865712. * 29.07 * (1. - (12.85/100))}{(161. + 460.)} = 66878096. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VP*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(161.+460.))*((0.002669* 351.)+(113.083* .998*(29.18+(3.168/13.6))/(63.+460.)))}{120. * 82.11 * 29.07 * .220 * .220} = 99.66 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 33.8 * 15.43 / 112.005 = .0047 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PHR = CS * QSSTD / (15.43 * 453.6)

PHR = .0047 * 66878096. / (15.43 * 453.6) = 44.493

FIELD DATA

PLANT	MORGO POWER PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	6LM58A
SAMPLE TYPE	M58A		
OPERATOR	CLARKE	PROBE LENGTH & TYPE	5' GLASS
AMBIENT TEMP.(DEG.F)	55.	NOZZLE 202 : 1.0.	.219
BAR.PRESS.(IN.HG)	29.18	ASSUMED MOISTURE	12.0
STATIC PRESS.(IN.H2O)	-1.50	SAMPLE BOX NUMBER	
FILTER NUMBER(S)	0002700	METER BOX NUMBER	FB3
STACK INSIDE DIM.(IN)	240.00 .00	METER HEAD DIFF.	2.00
PITOT TUBE COEFF.	.84	C FACTOR	2.14
THERM. NO.	201	PROBE HEATER SETTING	320.
LEAKAGE	.001 CFM @ .0 IN.HG	HEATER BOX SETTING	320.
METER CALIB. FACTOR	1.006	REFERENCE PRESS. DIFF.	.00
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	940	741.144									
	10.0	950	752.000	1.900	3.40	3.40	158.	57.	57.	6.0	320.	44.
	20.0	1000	759.990	1.700	3.05	3.10	159.	62.	56.	6.0	311.	40.
	30.0	1010	769.825	1.700	3.07	3.10	161.	70.	57.	6.0	325.	44.
	40.0	1020	778.700	1.600	2.90	2.90	160.	76.	58.	5.5	322.	42.
	50.0	1030	787.350	1.700	3.10	3.10	163.	80.	60.	6.0	315.	48.
	60.0	1040	795.426	1.700	3.10	3.10	160.	81.	61.	6.0	316.	48.
	70.0	1050	804.563	1.700	3.10	3.10	159.	84.	62.	6.0	323.	48.
	80.0	1100	813.795	1.800	3.30	3.30	160.	86.	64.	6.0	314.	46.
	90.0	1110	825.525	1.900	3.50	3.50	164.	87.	66.	6.5	314.	48.
	100.0	1120	834.410	1.800	3.30	3.30	162.	88.	66.	6.0	324.	48.
	110.0	1130	843.495	1.800	3.35	3.40	160.	90.	70.	6.5	322.	48.
	120.0	1140	853.815	1.800	3.30	3.30	164.	90.	70.	6.0	314.	46.
TOTALS	120.0		112.671									
AVERAGE					3.21	3.22	161.	79.	63.	6.0	318.	46.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONGO POWER PLEASANTS

TEST LOCATION UNIT 1

TEST ENGINEER

CLARKE

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
TB	TIME-START	940	940
TF	TIME-FINISH	1140	1140
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.006	1.006
DN	SAMPLING NOZZLE DIAMETER	.219 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
DPM	AVERAGE ORIFICE PRESSURE DROP	3.22 IN-H2O	81.7 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	112.671 CU-FT	3.190 CU-M
TM	AVERAGE GAS METER TEMP	70.9 F	21.6 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	110.827 SCF	3.138 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	361.7	361.7
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	17.025 SCF	.482 SCM
BWO	PERCENT MOISTURE BY VOLUME	13.32	13.32
FMD	MOLE FRACTION DRY GAS	.867	.867
PCO2	PERCENT CO2 BY VOL., DRY	12.87	12.87
PO2	PERCENT O2 BY VOL., DRY	5.60	5.60
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.53	81.53
MD	MOLECULAR WT-DRY STACK GAS	30.28	30.28
MWS	MOLECULAR WT-STACK GAS	28.65	28.65

PB	BAROMETRIC PRESSURE	29.10	IN-HG	741.17	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.07	IN-HG	738.57	MM-HG
TS	AVERAGE STACK TEMP	161.	F	72.	C
VS	AVG STACK GAS VELOCITY	82.2	FPS	25.1	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	66583640.	SCFM	1885449.	SCMM
QS	ACTUAL STACK FLOW RATE	92959488.	ACFM	2632554.	ACMM
ISO	PERCENT ISOKINETIC	100.0		100.0	
MN	NaSSP MG. EPA 5	18.5		18.5	
CS	NaSSP	.0026	GR/DSCF*	5.896	MG/DSCM
PMR	NaSSP EMISSION RATE	24.503	LB/HR	11.11	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	3900.0		3900.0	
CS	SULFUR DIOXIDE	.5430	GR/DSCF*	1242.836	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5165.514	LB/HR	2343.08	KG/HR
MN	SULFURIC ACID MG. EPA 5	44.9		44.9	
CS	SULFURIC ACID	.0063	GR/DSCF*	14.309	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	59.470	LB/HR	26.98	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.6EM5BW

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 112.671 * 1.006 * (29.18 + 3.217 / 13.6)}{(71. + 460.)} = 110.827 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 362. = 17.03 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 17.03}{110.827 + 17.03} = 13.32 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 13.3}{100.} = .867$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.8/*44/100) + (5.6*32/100) + ((81.5+ .0) * 28/100 = 30.28

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.28* (1. -(13.32/100)) + 18. * (13.32/100) = 26.65

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 396.362 / (SQRT(28.85 * 29.07) * 12. = 82.19 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 82.19 * 45239. 3600/144 = 92959488. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWS/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 92959488. * 29.07 * (1. - (15.32/100))}{(161. + 460.)} = 66583640. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.56*(TS+460.))*((0.002669*VLC)+(VM*T*(PB+(PM/13.6))/(TM+460.)))/(TI*VS*PS*UN*DN)

$$ISO = \frac{(305.56*(161.+460.))*((0.002669* 362.)+(112.671*1.006*(29.18+(3.217/13.6))/(71.+460.)))}{120. * 82.19 * 29.07 * .219 * .219} = 99.96 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 18.5 * 15.43 / 110.627 = .0026 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PHR = CS * QSSTD / (15.43 * 453.6)

PHR = .0026 * 66583640. / (15.43 * 453.6) = 24.503

FIELD DATA

PLANT	MONGO POWER PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	60M5BW
SAMPLE TYPE	M5BW	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	CLARKE	NOZZLE 2-07: 1.0.	.221
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.18	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	F85
FILTER NUMBER(S)	0002706	METER HEAD DIFF.	1.95
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.002 CFM @ 8.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	.988		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	940	443.657									
	10.0	950	445.725	1.900	3.40	3.40	158.	60.	60.	7.0	317.	44.
	20.0	1000	463.125	1.700	3.07	3.10	159.	66.	60.	7.0	315.	40.
	30.0	1010	473.615	1.700	3.08	3.10	161.	72.	60.	7.0	316.	40.
	40.0	1020	483.400	1.600	2.90	2.90	160.	80.	65.	7.0	319.	45.
	50.0	1030	492.429	1.700	3.10	3.10	165.	82.	66.	7.0	315.	48.
	60.0	1040	500.700	1.700	3.20	3.20	160.	87.	67.	7.0	312.	48.
	70.0	1050	510.475	1.700	3.20	3.20	159.	88.	69.	7.0	319.	48.
	80.0	1100	520.710	1.800	3.40	3.40	160.	88.	72.	7.5	315.	50.
	90.0	1110	532.600	1.900	3.50	3.50	164.	90.	72.	8.0	312.	52.
	100.0	1120	542.000	1.800	3.30	3.40	162.	90.	74.	7.5	321.	50.
	110.0	1130	551.010	1.800	3.37	3.40	160.	90.	74.	7.5	319.	46.
	120.0	1140	561.844	1.800	3.40	3.40	164.	90.	74.	8.0	315.	44.
TOTALS	120.0		118.187									
AVERAGE					3.24	3.26	161.	82.	68.	7.3	316.	46.

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PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS: MONGO POKER PLEASANTS

TEST TEAM LEADER: CLARKE

TEST DESIGN: UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
TB	TIME-START	940	940
TF	TIME-FINISH	1140	1140
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.988	.988
DN	SAMPLING NOZZLE DIAMETER	.221 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.26 IN-H2O	82.8 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	118.187 CU-FT	3.347 CU-M
TM	AVERAGE GAS METER TEMP	74.8 F	23.8 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	113.366 SCF	3.210 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	360.6	360.6
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	16.973 SCF	.481 SCM
BWO	PERCENT MOISTURE BY VOLUME	13.02	13.02
FMD	MOLE FRACTION DRY GAS	.870	.870
PCO2	PERCENT CO2 BY VOL., DRY	12.67	12.67
PO2	PERCENT O2 BY VOL., DRY	5.60	5.60
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.53	81.53
MD	MOLECULAR WT-DRY STACK GAS	30.28	30.28
MWS	MOLECULAR WT-STACK GAS	26.08	26.08

PB	BAROMETRIC PRESSURE	29.18	IN-HG	741.17	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.07	IN-HG	738.37	MM-HG
TS	AVERAGE STACK TEMP	161.	F	72.	C
VS	AVG STACK GAS VELOCITY	82.1	FPS	25.0	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	66767304.	SCFM	1890650.	SCMM
QS	ACTUAL STACK FLOW RATE	92900992.	ACFM	2630678.	ACMM
ISO	PERCENT ISOKINETIC	100.1		100.1	
MN	NASSP MG. EPA 5	15.1		15.1	
CS	NASSP	.0018	GR/DSCF*	4.081	MG/DSCM
PMR	NASSP EMISSION RATE	17.009	LB/HR	7.72	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4050.0		4050.0	
CS	SULFUR DIOXIDE	.5512	GR/DSCF*	1261.730	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5256.510	LB/HR	2385.20	KG/HR
MN	SULFURIC ACID MG. EPA 5	82.4		82.4	
CS	SULFURIC ACID	.0112	GR/DSCF*	25.671	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	106.988	LB/HR	48.53	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.6DM58A

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 118.187 * .988 * (29.18 + 5.258 / 13.6)}{(75. + 460.)} = 113.366 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 361. = 16.97 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 16.97}{113.366 + 16.97} = 13.02 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 13.0}{100.} = .870$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.67*44/100) + (5.6*32/100) + ((81.5+ .0) * 28/100 = 30.28

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.28* (1. -(13.02/100)) + 18. * (13.02/100) = 28.68

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 396.362 / (SQRT(28.66 * 29.07) * 12. = 82.14 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 82.14 * 45239. 3600/144 = 92900992. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 92900992. * 29.07 * (1. - (13.02/100))}{(161. + 460.)} = 66767304. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.56*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.56*(161.+460.))*((0.002669* 361.)+(118.187* .988*(29.18+(5.258/13.6))/(75.+460.)))}{120. * 82.14 * 29.07 * .221 * .221} = 100.13 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 13.1 * 15.43 / 113.366 = .0018 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PHR = CS * QSSTD / (15.43 * 453.6)

PHR = .0018 * 66767304. / (15.43 * 453.6) = 17.009

FIELD DATA

PLANT	MUNO POWER-PLEASANTS		
SAMPLING LOCATION	UNIT 1	DATE	12/01/82
SAMPLE TYPE	M5B-P400	RUN NUMBER	7AM5BP
OPERATOR	DD		
AMBIENT TEMP.(DEG.F)	55.	PROBE LENGTH & TYPE	6' GLASS
BAR.PRESS.(IN.HG)	29.14	NOZZLE 2-11 : I.D.	.222
STATIC PRESS.(IN.H2O)	-1.50	ASSUMED MOISTURE	12.0
FILTER NUMBER(S)	0002702	SAMPLE BOX NUMBER	
STACK INSIDE DIM.(IN)	240.00 .00	METER BOX NUMBER	FB4
PITOT TUBE COEFF.	.84	METER HEAD DIFF.	1.87
THERM. NO.			
LEAKAGE	.006 CFM @ 7.0 IN.HG	PROBE HEATER SETTING	400.
METER CALIB. FACTOR	1.037	HEATER BOX SETTING	320.

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1242	869.665									
	10.0	0	878.800	1.700	3.16	3.16	161.	63.	63.	5.5	324.	43.
	20.0	0	888.190	1.800	3.34	3.34	163.	65.	63.	6.0	345.	40.
	30.0	0	897.600	1.800	3.36	3.36	162.	70.	63.	6.2	325.	48.
	40.0	0	907.320	1.900	3.56	3.56	162.	73.	63.	6.6	340.	57.
	50.0	0	917.040	1.900	3.56	3.56	163.	76.	65.	6.5	328.	63.
	60.0	0	926.820	1.900	3.58	3.58	162.	77.	66.	6.6	341.	61.
	70.0	0	936.360	1.800	3.40	3.40	161.	78.	67.	6.2	326.	63.
	80.0	0	946.110	1.900	3.59	3.59	162.	78.	68.	6.5	340.	61.
	90.0	0	955.610	1.800	3.40	3.40	163.	79.	68.	6.2	328.	57.
	100.0	0	965.120	1.800	3.39	3.39	165.	79.	69.	6.2	336.	54.
	110.0	0	974.630	1.800	3.39	3.39	164.	79.	69.	6.2	341.	54.
	120.0	1442	984.300	1.900	3.55	3.55	170.	79.	70.	6.5	325.	56.
TOTALS	120.0											
AVERAGE			114.635		3.44	3.44	163.	75.	66.	6.3	333.	55.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONO POWER-PLEASANTS | DD

TEST 7AM58P UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
TB	TIME-START	1242	1242
TF	TIME-FINISH	1442	1442
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.037	1.037
DN	SAMPLING NOZZLE DIAMETER	.222 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.44 IN-H2O	87.4 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	114.635 CU-FT	3.246 CU-M
TM	AVERAGE GAS METER TEMP	70.4 F	21.3 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	116.250 SCF	3.292 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	340.9	340.9
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	16.046 SCF	.454 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.13	12.13
FMO	MOLE FRACTION DRY GAS	.879	.879
PCO2	PERCENT CO2 BY VOL., DRY	12.53	12.53
PO2	PERCENT O2 BY VOL., DRY	6.00	6.00
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.47	81.47
MD	MOLECULAR WT-DRY STACK GAS	30.24	30.24
MWS	MOLECULAR WT-STACK GAS	28.76	28.76

PB	BAROMETRIC PRESSURE	29.14	IN-HG	740.16	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.03	IN-HG	737.35	MM-HG
TS	AVERAGE STACK TEMP	163.	F	73.	C
VS	AVG STACK GAS VELOCITY	84.0	FPS	25.6	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	6862060.	SCFH	1943117.	SCMH
QS	ACTUAL STACK FLOW RATE	94994128.	ACFH	2689949.	ACMH
ISO	PERCENT ISOKINETIC	99.0		99.0	
MN	FILTERABLE PART MG. EPA 5	46.4		46.4	
CS	FILTERABLE PART	.0062	GR/DSCF*	14.097	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	60.381	LB/HR	27.39	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4230.0		4230.0	
CS	SULFUR DIOXIDE	.5615	GR/DSCF*	1285.115	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5504.604	LB/HR	2496.89	KG/HR
MN	SULFURIC ACID MG. EPA 5	110.0		110.0	
CS	SULFURIC ACID	.0146	GR/DSCF*	33.419	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	143.146	LB/HR	64.93	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.7AM5BP

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 114.635 * 1.037 * (29.14 + 5.440 / 13.6)}{(70. + 460.)} = 116.250 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 341. = 16.05 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 16.05}{116.250 + 16.05} = 12.13 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.1}{100.} = .879$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.53*44/100) + (6.0*32/100) + ((81.5+ .0) * 28/100 = 30.24

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.24* (1. -(12.13/100)) + 18. * (12.13/100) = 28.76

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 405.550 / (SQRT(28.76 * 29.03) * 12. = 83.99 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 83.99 * 45239. 3600/144 = 94994128. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 94994128. * 29.03 * (1. - (12.13/100))}{(163. + 460.)} = 68620160. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(163.+460.))*((0.002669* 341.)+(114.635*1.037*(29.14+(5.440/13.6))/(70.+460.)))}{120. * 83.99 * 29.03 * .222 * .222} = 99.01 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 46.4 * 15.43 / 116.250 = .0062 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0062 * 68620160. / (15.43 * 453.6) = 60.381

FIELD DATA

PLANT	MONO POWER-PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	78M5BP
SAMPLE TYPE	M5B-P400		
OPERATOR	DD	PROBE LENGTH & TYPE	5' GLASS
AMBIENT TEMP.(DEG.F)	55.	NOZZLE 2-10 : 1.D.	.221
BAR.PRESS.(IN.HG)	29.14	ASSUMED MOISTURE	12.0
STATIC PRESS.(IN.H2O)	-1.50	SAMPLE BOX NUMBER	
FILTER NUMBER(S)	0002703	METER BOX NUMBER	F88
STACK INSIDE DIM.(IN)	240.00 .00	METER HEAD DIFF.	1.90
PITOT TUBE COEFF.	.84		
THERM. NO.		PROBE HEATER SETTING	400.
LEAKAGE	.008 CFM @ 9.0 IN.HG	HEATER BOX SETTING	320.
METER CALIB. FACTOR	.998		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1243	607.517									
	10.0	0	616.850	1.700	3.16	3.16	161.	62.	61.	7.3	327.	44.
	20.0	0	626.530	1.800	3.34	3.34	163.	64.	61.	8.2	337.	42.
	30.0	0	636.270	1.800	3.36	3.36	162.	67.	61.	8.2	323.	43.
	40.0	0	646.210	1.900	3.56	3.56	162.	70.	61.	8.6	328.	47.
	50.0	0	656.180	1.900	3.56	3.56	163.	72.	63.	8.7	332.	51.
	60.0	0	666.250	1.900	3.58	3.58	162.	73.	63.	8.8	340.	52.
	70.0	0	676.110	1.800	3.40	3.40	161.	73.	64.	8.5	340.	55.
	80.0	0	686.100	1.900	3.59	3.59	162.	74.	65.	8.8	326.	58.
	90.0	0	695.890	1.800	3.40	3.40	163.	74.	66.	8.6	324.	60.
	100.0	0	705.700	1.800	3.39	3.39	165.	75.	66.	8.5	333.	60.
	110.0	0	715.470	1.800	3.39	3.39	164.	75.	67.	8.5	334.	57.
	120.0	1443	725.407	1.900	3.55	3.55	170.	75.	67.	8.8	339.	56.
TOTALS	120.0		117.890									
AVERAGE					3.44	3.44	163.	71.	64.	8.5	332.	52.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONO POWER-PLEASANTS | DD

TEST 78M58P UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
TB	TIME-START	1243	1243
TF	TIME-FINISH	1443	1443
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.998	.998
DN	SAMPLING NOZZLE DIAMETER	.221 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.44 IN-H2O	87.4 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	117.690 CU-FT	3.338 CU-M
TM	AVERAGE GAS METER TEMP	67.5 F	19.7 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	115.700 SCF	3.276 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	363.1	363.1
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	17.091 SCF	.484 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.87	12.87
FMO	MOLE FRACTION DRY GAS	.871	.871
PCO2	PERCENT CO2 BY VOL., DRY	12.53	12.53
PO2	PERCENT O2 BY VOL., DRY	6.00	6.00
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.47	81.47
MD	MOLECULAR WT-DRY STACK GAS	30.24	30.24
MWS	MOLECULAR WT-STACK GAS	28.67	28.67

PB	BAROMETRIC PRESSURE	29.14	IN-HG	740.16	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.03	IN-HG	737.35	MM-HG
TS	AVERAGE STACK TEMP	163.	F	73.	C
VS	AVG STACK GAS VELOCITY	84.1	FPS	25.6	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	68148672.	SCFH	1929766.	SCMH
QS	ACTUAL STACK FLOW RATE	95144480.	ACFH	2694207.	ACMH
ISO	PERCENT ISOKINETIC	100.1		100.1	
MN	FILTERABLE PART MG. EPA 5	38.0		38.0	
CS	FILTERABLE PART	.0051	GR/DSCF*	11.600	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	49.344	LB/HR	22.38	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4240.0		4240.0	
CS	SULFUR DIOXIDE	.5655	GR/DSCF*	1294.277	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5505.756	LB/HR	2497.41	KG/HR
MN	SULFURIC ACID MG. EPA 5	118.0		118.0	
CS	SULFURIC ACID	.0157	GR/DSCF*	36.020	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	153.226	LB/HR	69.50	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.78MS6P

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 117.890 * .998 * (29.14 + 3.440 / 13.6)}{(67. + 460.)} = 115.700 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 363. = 17.09 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 17.09}{115.700 + 17.09} = 12.87 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.9}{100.} = .871$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.53*44/100) + (6.0*32/100) + ((81.5+ .0) * 28/100 = 30.24

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.24* (1. -(12.87/100)) + 18. * (12.87/100) = 28.67

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 405.550 / (SQRT(28.67 * 29.03) * 12. = 84.13 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 84.13 * 45239. 3600/144 = 95144480. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 95144480. * 29.03 * (1. - (12.87/100))}{(163. + 460.)} = 68148672. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(163.+460.))*((0.002669*363.)+(117.890*.998*(29.14+(5.440/13.6))/(67.+460.)))}{120. * 84.13 * 29.03 * .221 * .221} = 100.12 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 58.0 * 15.43 / 115.700 = .0051 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0051 * 68148672. / (15.43 * 453.6) = 49.344

FIELD DATA

PLANT	MONGO POWER PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	7CM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	CLARKE	NOZZLE 2-09: I.D.	.220
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.14	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	F83
FILTER NUMBER(S)	0002704	METER HEAD DIFF.	2.00
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.003 CFM @ 10.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	1.006		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1240	854.012									
	10.0	1250	861.700	1.700	3.10	3.10	161.	68.	68.	4.0	323.	40.
	20.0	1300	870.870	1.800	3.26	3.30	163.	72.	64.	7.0	316.	38.
	30.0	1310	880.780	1.800	3.30	3.30	162.	80.	65.	8.0	325.	40.
	40.0	1320	890.725	1.900	3.50	3.50	162.	85.	65.	8.0	325.	42.
	50.0	1330	899.800	1.900	3.50	3.50	163.	87.	67.	8.0	331.	48.
	60.0	1340	910.245	1.900	3.50	3.50	162.	88.	68.	8.0	330.	52.
	70.0	1350	919.191	1.800	3.30	3.30	162.	90.	68.	8.0	328.	52.
	80.0	1400	928.858	1.900	3.50	3.50	162.	90.	70.	8.5	317.	56.
	90.0	1410	937.474	1.800	3.30	3.30	163.	90.	70.	8.0	316.	50.
	100.0	1420	947.878	1.800	3.30	3.30	165.	91.	71.	8.0	320.	50.
	110.0	1430	958.130	1.800	3.30	3.30	164.	91.	71.	8.0	322.	54.
	120.0	1440	967.794	1.900	3.50	3.50	170.	91.	71.	8.5	323.	54.
TOTALS	120.0		113.782									
AVERAGE					3.36	3.37	163.	85.	68.	7.7	323.	48.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONGO POWER PLEASANTS

TEST TEAM LEADER

CLARKE

TEST 7CM5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
TB	TIME-START	1240	1240
TF	TIME-FINISH	1440	1440
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.006	1.006
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.37 IN-H2O	85.5 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	113.782 CU-FT	3.222 CU-M
TM	AVERAGE GAS METER TEMP	76.7 F	24.8 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	110.603 SCF	3.132 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	343.8	343.8
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	16.183 SCF	.458 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.76	12.76
FMO	MOLE FRACTION DRY GAS	.872	.872
PCO2	PERCENT CO2 BY VOL., DRY	12.53	12.53
PO2	PERCENT O2 BY VOL., DRY	6.00	6.00
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.47	81.47
MD	MOLECULAR WT-DRY STACK GAS	30.24	30.24
MWS	MOLECULAR WT-STACK GAS	28.68	28.68

PB	BAROMETRIC PRESSURE	29.14	IN-HG	740.16	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.03	IN-HG	737.35	MM-HG
TS	AVERAGE STACK TEMP	165.	F	73.	C
VS	AVG STACK GAS VELOCITY	84.1	FPS	25.6	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	68212080.	SCFM	1931562.	SCMM
QS	ACTUAL STACK FLOW RATE	95129088.	ACFM	2693771.	ACMM
ISO	PERCENT ISOKINETIC	96.5		96.5	
MN	FILTERABLE PART MG. EPA 5	80.0		80.0	
CS	FILTERABLE PART	.0112	GR/DSCF*	25.546	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	108.770	LB/HR	49.34	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4070.0		4070.0	
CS	SULFUR DIOXIDE	.5678	GR/DSCF*	1299.636	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5533.695	LB/HR	2510.08	KG/HR
MN	SULFURIC ACID MG. EPA 5	67.3		67.3	
CS	SULFURIC ACID	.0094	GR/DSCF*	21.490	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	91.503	LB/HR	41.51	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 7CM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 113.782 * 1.006 * (29.14 + 5.367 / 13.6)}{(77. + 460.)} = 110.603 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 344. = 16.18 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 16.18}{110.603 + 16.18} = 12.76 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.8}{100.} = .872$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.53*44/100) + (6.0*32/100) + ((81.5+ .0) * 28/100 = 30.24

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.24* (1. -(12.76/100)) + 18. * (12.76/100) = 28.68

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 405.577 / (SQRT(28.68 * 29.03) * 12. = 84.11 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 84.11 * 45239. 3600/144 = 95129088. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 95129088. * 29.03 * (1. - (12.76/100))}{(165. + 460.)} = 68212080. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(165.+460.))*((0.002669* 344.)+(113.782*1.006*(29.14+(3.367/13.6))/(77.+460.)))}{120. * 84.11 * 29.03 * .220 * .220} = 96.49 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 80.0 * 15.43 / 110.603 = .0112 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0112 * 68212080. / (15.43 * 453.6) = 108.770

FIELD DATA

PLANT	MONGO POWER PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	TUM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	CLARKE	NOZZLE 2-12: I.D.	.220
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.14	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	F85
FILTER NUMBER(S)	0002705	METER HEAD DIFF.	1.95
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.002 CFM @ 8.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	.988		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1240	562.046									
	10.0	1250	570.925	1.700	3.10	3.10	161.	70.	70.	7.0	315.	45.
	20.0	1300	581.270	1.800	3.28	3.30	163.	72.	70.	7.5	320.	40.
	30.0	1310	591.450	1.800	3.30	3.30	162.	81.	70.	8.0	316.	40.
	40.0	1320	600.525	1.900	3.50	3.50	162.	86.	71.	8.0	314.	44.
	50.0	1330	611.000	1.900	3.50	3.50	163.	89.	72.	8.0	329.	46.
	60.0	1340	622.351	1.900	3.54	3.50	162.	90.	74.	8.0	323.	48.
	70.0	1350	630.700	1.800	3.36	3.40	162.	91.	75.	8.0	324.	52.
	80.0	1400	641.525	1.900	3.50	3.50	162.	91.	75.	8.0	318.	56.
	90.0	1410	650.620	1.800	3.40	3.40	163.	92.	76.	8.0	315.	64.
	100.0	1420	661.626	1.800	3.40	3.40	165.	93.	77.	8.0	320.	66.
	110.0	1430	672.600	1.800	3.40	3.40	164.	93.	78.	8.0	324.	70.
	120.0	1440	683.522	1.900	3.50	3.50	170.	94.	78.	8.0	326.	68.
TOTALS	120.0		121.476									
AVERAGE					3.40	3.40	163.	87.	74.	7.9	320.	53.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONGO POWER PLEASANTS | CLARKE

TEST 70M5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
TB	TIME-START	1240	1240
TF	TIME-FINISH	1440	1440
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.988	.988
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.40 IN-H2O	86.4 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	121.476 CU-FT	3.440 CU-M
TM	AVERAGE GAS METER TEMP	80.3 F	26.9 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	115.201 SCF	3.262 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	338.7	338.7
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	15.943 SCF	.451 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.16	12.16
FMD	MOLE FRACTION DRY GAS	.878	.878
PCO2	PERCENT CO2 BY VOL., DRY	12.53	12.53
PO2	PERCENT O2 BY VOL., DRY	6.00	6.00
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.47	81.47
MD	MOLECULAR WT-DRY STACK GAS	30.24	30.24
MWS	MOLECULAR WT-STACK GAS	28.76	28.76

PB	BAROMETRIC PRESSURE	29.14	IN-HG	740.16	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.03	IN-HG	737.55	MM-HG
TS	AVERAGE STACK TEMP	163.	F	73.	C
VS	AVG STACK GAS VELOCITY	84.0	FPS	25.6	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	68598000.	SCFH	1942490.	SCMH
QS	ACTUAL STACK FLOW RATE	95006016.	ACFH	2690286.	ACMH
ISO	PERCENT ISOKINETIC	99.9		99.9	
MN	FILTERABLE PART MG. EPA 5	86.3		86.3	
CS	FILTERABLE PART	.0116	GR/DSCF*	26.458	MG/DSCM
PPH	FILTERABLE PART EMISSION RATE	113.290	LB/HR	51.39	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4210.0		4210.0	
CS	SULFUR DIOXIDE	.5659	GR/DSCF*	1290.687	MG/DSCM
PPH	SULFUR DIOXIDE EMISSION RATE	5526.685	LB/HR	2506.90	KG/HR
MN	SULFURIC ACID MG. EPA 5	78.4		78.4	
CS	SULFURIC ACID	.0105	GR/DSCF*	24.036	MG/DSCM
PPH	SULFURIC ACID EMISSION RATE	102.920	LB/HR	46.68	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 70M5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 121.476 * .988 * (29.14 + 3.400 / 13.6)}{(80. + 460.)} = 115.201 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 339. = 15.94 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 15.94}{115.201 + 15.94} = 12.16 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.2}{100.} = .878$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.53*44/100) + (6.0*32/100) + ((81.5+ .0) * 28/100 = 30.24

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.24* (1. -(12.16/100)) + 18. * (12.16/100) = 28.76

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 405.577 / (SQRT(28.76 * 29.03) * 12. = 84.00 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 84.00 * 45239. 3600/144 = 95006016. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 95006016. * 29.03 * (1. - (12.16/100))}{(163. + 460.)} = 68598000. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(163.+460.))*((0.002669* 339.)+(121.476* .988*(29.14+(3.400/13.6))/(80.+460.)))}{120. * 84.00 * 29.03 * .220 * .220} = 99.94 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 86.3 * 15.43 / 115.201 = .0116 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0116 * 68598000. / (15.43 * 453.6) = 113.290

FIELD DATA

PLANT	MONO POWER-PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	BAM5BW
SAMPLE TYPE	M5BW	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	DD	NOZZLE 2-DS : 1.D.	.219
AMBIENT TEMP.(DEG.F)	80.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.14	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB4
FILTER NUMBER(S)	0002707	METER HEAD DIFF.	1.87
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	320.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.			
LEAKAGE	.008 CFM @ 6.0 IN.HG		
METER CALIB. FACTOR	1.037		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1545	984.363									
	10.0	0	993.670	1.700	3.05	3.05	164.	65.	65.	4.8	342.	46.
	20.0	0	2.440	1.800	2.87	2.87	163.	67.	65.	4.4	318.	40.
	30.0	0	11.240	1.800	2.89	2.89	163.	72.	65.	4.4	321.	41.
	40.0	0	20.250	1.700	3.09	3.09	162.	76.	65.	4.7	316.	42.
	50.0	0	29.440	1.800	2.91	2.91	162.	78.	67.	4.6	322.	44.
	60.0	0	38.720	1.800	3.25	3.25	163.	70.	67.	5.0	327.	43.
	70.0	0	48.040	1.800	3.26	3.26	161.	73.	67.	5.0	320.	47.
	80.0	0	57.370	1.900	3.44	3.44	165.	77.	67.	5.3	321.	51.
	90.0	0	67.180	1.900	3.46	3.46	162.	79.	68.	5.5	323.	55.
	100.0	0	77.030	2.000	3.66	3.66	162.	80.	69.	5.8	326.	60.
	110.0	0	87.340	1.900	3.46	3.46	160.	80.	70.	5.7	327.	66.
	120.0	1810	96.145	1.900	3.47	3.47	163.	81.	71.	5.8	324.	69.
TOTALS	120.0		111.582									
AVERAGE					3.23	3.23	163.	75.	67.	5.1	324.	50.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MUNO POWER-PLEASANTS — DO

TEST RAMSON — UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
TB	TIME-START	1545	1545
TF	TIME-FINISH	1810	1810
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.037	1.037
DN	SAMPLING NOZZLE DIAMETER	.219 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.23 IN-H2O	82.1 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	111.582 CU-FT	3.160 CU-M
TM	AVERAGE GAS METER TEMP	71.0 F	21.7 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	112.971 SCF	3.199 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	380.3	380.3
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	17.901 SCF	.507 SCM
BWO	PERCENT MOISTURE BY VOLUME	13.68	13.68
FMD	MOLE FRACTION DRY GAS	.863	.863
PCO2	PERCENT CO2 BY VOL., DRY	12.73	12.73
PO2	PERCENT O2 BY VOL., DRY	5.70	5.70
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.57	81.57
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	26.39	26.39

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PB	BAROMETRIC PRESSURE	29.14	IN-HG	740.16	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.03	IN-HG	737.35	MM-HG
TS	AVERAGE STACK TEMP	165.	F	73.	C
VS	AVG STACK GAS VELOCITY	83.0	FPS	25.3	MPS
AS	STACK AREA	45259.	SQ-IN	29.188	SQ-M
QSSTD	STACK FLOW RATE, DRY*	6665984.	SCFM	188748.	SCMM
QS	ACTUAL STACK FLOW RATE	9390742.	ACFM	265941.	ACMM
ISO	PERCENT ISOKINETIC	101.8		101.8	
MN	NASSP MG. EPA 5	21.0		21.0	
CS	NASSP	.0029	GR/DSCF*	0.365	MG/DSCM
PMR	NASSP EMISSION RATE	27.316	LB/HR	12.39	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4070.0		4070.0	
CS	SULFUR DIOXIDE	.5559	GR/DSCF*	1272.391	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5294.096	LB/HR	2401.40	KG/HR
MN	SULFURIC ACID MG. EPA 5	87.7		87.7	
CS	SULFURIC ACID	.0120	GR/DSCF*	27.417	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	114.077	LB/HR	51.75	KG/HR

* 68 DEG F, 29.92 IN.HG.

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EXAMPLE PARTICULATE CALCULATIONS TEST NO.8AM5BM

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 111.582 * 1.037 * (29.14 + 3.254 / 13.6)}{(71. + 460.)} = 112.971 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 380. = 17.90 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 17.90}{112.971 + 17.90} = 13.68 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 13.7}{100.} = .863$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.7*44/100) + (5.7*32/100) + ((81.6+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26* (1. -(13.68/100)) + 18. * (13.68/100) = 28.59

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 599.700 / (SQRT(28.54 * 29.03) * 12. = 83.03 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 83.03 * 45239. 3600/144 = 93905792. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 93905792. * 29.03 * (1. - (13.68/100))}{(163. + 460.)} = 66655984. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.56*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.56*(163.+460.))*((0.002669*380.)+(111.582*1.037*(29.14+(5.234/13.6))/(71.+460.)))}{120. * 85.03 * 29.03 * .219 * .219} = 101.78 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 21.0 * 15.43 / 112.471 = .0029 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0029 * 66655984. / (15.43 * 453.6) = 27.316

FIELD DATA

PLANT	MUNO POWER-PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	80M5BA
SAMPLE TYPE	M5BA	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	DO	NOZZLE 2-01 : I.D.	.220
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.14	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	F88
FILTER NUMBER(S)	0002708	METER HEAD DIFF.	1.90
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	320.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.			
LEAKAGE	.008 CFM @ 7.0 IN.HG		
METER CALIB. FACTOR	.998		
READ & RECORD DATA EVERY 10.0 MINUTES			

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1546	725.649									
	10.0	0	734.870	1.700	3.05	3.05	164.	64.	63.	5.8	334.	50.
	20.0	0	743.870	1.600	2.87	2.87	163.	66.	63.	5.7	326.	42.
	30.0	0	752.950	1.600	2.89	2.89	163.	70.	63.	5.7	335.	49.
	40.0	0	762.260	1.700	3.09	3.09	162.	73.	63.	6.0	337.	54.
	50.0	0	771.360	1.600	2.91	2.91	162.	75.	65.	5.8	336.	59.
	60.0	0	780.860	1.800	3.25	3.25	163.	66.	65.	6.0	319.	47.
	70.0	0	790.450	1.800	3.26	3.26	161.	71.	65.	6.1	318.	64.
	80.0	0	800.270	1.900	3.44	3.44	165.	74.	65.	6.4	318.	74.
	90.0	0	810.200	1.900	3.46	3.46	162.	76.	66.	6.4	320.	63.
	100.0	0	820.150	2.000	3.66	3.66	162.	77.	67.	6.7	318.	55.
	110.0	0	830.360	1.900	3.46	3.46	166.	78.	68.	6.4	320.	52.
	120.0	1810	839.683	1.900	3.47	3.47	163.	78.	69.	6.6	319.	51.
TOTALS	120.0		114.034									
AVERAGE					3.23	3.23	163.	73.	65.	6.1	325.	55.

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PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONO POWER-PLEASANTS | DO

TEST 80M50A UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
TB	TIME-START	1546	1546
TF	TIME-FINISH	1810	1810
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.998	.998
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
DPM	AVERAGE ORIFICE PRESSURE DROP	3.23 IN-H2O	82.1 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	114.034 CU-FT	3.229 CU-M
TM	AVERAGE GAS METER TEMP	68.8 F	20.5 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	111.567 SCF	3.159 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	522.0	522.0
VWS	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	15.157 SCF	.429 SCM
BWO	PERCENT MOISTURE BY VOLUME	11.96	11.96
FMD	MOLE FRACTION DRY GAS	.880	.880
PCO2	PERCENT CO2 BY VOL., DRY	12.73	12.73
PO2	PERCENT O2 BY VOL., DRY	5.70	5.70
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.57	81.57
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	26.80	26.80

PB	BAROMETRIC PRESSURE	29.14	IN-HG	740.16	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.03	IN-HG	737.35	MM-HG
TS	AVERAGE STACK TEMP	165.	F	73.	C
VS	AVG STACK GAS VELOCITY	82.7	FPS	25.2	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	6733232.	SCFM	1918002.	SCMM
QS	ACTUAL STACK FLOW RATE	93561648.	ACFM	2649386.	ACMM
ISO	PERCENT ISOKINETIC	98.0		98.0	
MN	NWSSP MG. EPA 5	18.8		18.8	
CS	NWSSP	.0026	GR/DSCF*	5.951	MG/DSCM
PMR	NWSSP EMISSION RATE	25.162	LB/HR	11.41	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	550.0		550.0	
CS	SULFUR DIOXIDE	.0456	GR/DSCF*	104.465	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	441.679	LB/HR	200.35	KG/HR
MN	SULFURIC ACID MG. EPA 5	120.0		120.0	
CS	SULFURIC ACID	.0166	GR/DSCF*	37.987	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	160.611	LB/HR	72.85	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.88MS0A

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 114.034 * .998 * (29.14 + 5.234 / 13.6)}{(69. + 460.)} = 111.567 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VAL = .04707 * VLC

VAL = .04707 * 322. = 15.16 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VAC) / (VMSTD + VAC)

$$BWO = \frac{100. * 15.16}{111.567 + 15.16} = 11.96 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.0}{100.} = .880$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.75*44/100) + (5.7*32/100) + ((81.6+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26* (1. -(11.96/100)) + 18. * (11.96/100) = 28.80

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PNTS)

VS = 85.49 * .84 * 349.700 / (SQRT(28.80 * 29.03) * 12. = 82.73 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 82.73 * 45239. 3600/144 = 93501648. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWS/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 93501648. * 29.03 * (1. - (11.96/100))}{(\ 105. + 460.)} = 67755252.\ SCFM$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TI*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(\ 105.+460.))*((0.002669*\ 522.)+(\ 114.034*\ .998*(\ 29.14+(\ \ 5.234/13.6)))/(\ \ 69.+460.)))}{120. *\ \ 82.73 *\ \ 29.03 *\ .220 *\ .220} = 98.02\ PERCENT$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 10.4 * 15.43 / 111.567 = .0026 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PHR = CS * QSSTD / (15.43 * 455.6)

PHR = .0026 * 67755252. / (15.43 * 455.6) = 25.182

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END OF PROGRAM
:EOJ
CPU SEC. = 26.  ELAPSED MIN. = 1.  TUE, FEB  6, 1985, 10:05 AM
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FIELD DATA

PLANT	MORGO POWER PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	8CM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	CLARKE	NOZZLE 2-02: I.D.	.219
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.14	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB3
FILTER NUMBER(S)	0002709	METER HEAD DIFF.	2.00
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.015 CFM @ 10.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	1.006		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1545	968.088									
	10.0	1555	978.415	1.700	3.08	3.10	164.	68.	68.	6.0	320.	50.
	20.0	1605	985.825	1.600	2.90	2.90	163.	74.	64.	5.5	308.	40.
	30.0	1615	993.920	1.600	2.90	2.90	163.	80.	65.	5.5	318.	40.
	40.0	1625	3.427	1.700	3.10	3.10	162.	81.	65.	6.0	324.	44.
	50.0	1700	14.220	1.600	2.95	3.00	162.	86.	66.	6.0	313.	50.
	60.0	1710	22.222	1.800	3.28	3.30	163.	74.	64.	6.0	327.	48.
	70.0	1720	31.611	1.860	3.30	3.30	161.	79.	66.	6.0	300.	48.
	80.0	1730	42.424	1.900	3.47	3.50	165.	86.	66.	7.0	328.	54.
	90.0	1740	51.298	1.900	3.50	3.50	162.	90.	68.	7.0	309.	60.
	100.0	1750	60.300	2.000	3.70	3.70	162.	91.	69.	7.0	319.	60.
	110.0	1800	71.348	1.900	3.50	3.50	166.	92.	70.	7.0	319.	60.
	120.0	1810	81.268	1.900	3.50	3.50	163.	94.	71.	7.0	312.	62.
TOTALS	120.0		113.180									
AVERAGE					3.26	3.27	163.	83.	67.	6.3	316.	51.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONGU POWER PLEASANTS

TEST LEAD LEADER

CLARKE

TEST 8CM58 UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
IB	TIME-START	1545	1545
IF	TIME-FINISH	1810	1810
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.006	1.006
DN	SAMPLING NOZZLE DIAMETER	.219 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.27 IN-H2O	83.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	113.180 CU-FT	3.205 CU-M
TM	AVERAGE GAS METER TEMP	74.9 F	23.8 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	110.370 SCF	3.125 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	332.9	332.9
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	15.670 SCF	.444 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.43	12.43
FMO	MOLE FRACTION DRY GAS	.876	.876
PCO2	PERCENT CO2 BY VOL., DRY	12.73	12.73
PO2	PERCENT O2 BY VOL., DRY	5.70	5.70
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.57	81.57
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	26.74	26.74

PB	BAROMETRIC PRESSURE	29.14	IN-HG	740.16	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.03	IN-HG	737.35	MM-HG
TS	AVERAGE STACK TEMP	163.	F	73.	C
VS	AVG STACK GAS VELOCITY	82.8	FPS	25.2	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	67457920.	SCFM	1909640.	SCMM
QS	ACTUAL STACK FLOW RATE	93655840.	ACFM	2652053.	ACMM
ISO	PERCENT ISOKINETIC	98.3		98.3	
MN	FILTERABLE PART MG. EPA 5	92.3		92.3	
CS	FILTERABLE PART	.0129	GR/DSCF*	29.536	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	124.332	LB/HR	56.40	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	3440.0		3440.0	
CS	SULFUR DIOXIDE	.4809	GR/DSCF*	1100.786	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	4633.623	LB/HR	2101.90	KG/HR
MN	SULFURIC ACID MG. EPA 5	58.6		58.6	
CS	SULFURIC ACID	.0082	GR/DSCF*	18.752	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	78.937	LB/HR	35.81	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. RLM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 115.180 * 1.006 * (29.14 + 5.275 / 13.6)}{(75. + 460.)} = 110.370 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 333. = 15.67 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 15.67}{110.370 + 15.67} = 12.43 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.4}{100.} = .876$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.7*44/100) + (5.7*32/100) + ((81.6+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26* (1. -(12.43/100)) + 18. * (12.43/100) = 28.74

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 349.700 / (SQRT(28.74 * 29.03) * 12. = 82.81 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 82.81 * 45239. 3600/144 = 93655840. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 93655840. * 29.03 * (1. - (12.43/100))}{(165. + 460.)} = 67437920. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VP*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(165.+460.))*((0.002669* 333.)+(113.180*1.006*(29.14+(3.275/13.6))/(75.+460.)))}{120. * 82.81 * 29.03 * .219 * .219} = 98.29 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 42.3 * 15.43 / 110.370 = .0129 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0129 * 6743/920. / (15.43 * 453.6) = 124.352

FIELD DATA

PLANT	MORGO POWER PLEASANTS	DATE	12/01/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	80M58
SAMPLE TYPE	M5D	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	CLARKE	NOZZLE 2-07: I.D.	.221
AMBIENT TEMP.(DEG.F)	55.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.14	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB5
FILTER NUMBER(S)	0002710	METER HEAD DIFF.	1.95
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.002 CFM @ 8.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	.998		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (Cu.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1545	683.746									
	10.0	1555	694.585	1.700	3.10	3.10	164.	73.	73.	5.0	323.	44.
	20.0	1605	702.225	1.600	2.90	2.90	163.	76.	72.	5.0	312.	40.
	30.0	1615	711.315	1.600	2.90	3.00	163.	82.	72.	5.0	317.	40.
	40.0	1625	721.300	1.700	3.10	3.20	162.	87.	72.	5.0	322.	40.
	50.0	1700	733.700	1.600	3.00	3.00	162.	90.	74.	5.0	318.	40.
	60.0	1710	741.610	1.800	3.30	3.30	163.	78.	74.	5.0	308.	42.
	70.0	1720	750.895	1.800	3.35	3.40	161.	84.	74.	5.5	317.	40.
	80.0	1730	762.150	1.900	3.50	3.50	165.	88.	74.	7.0	322.	45.
	90.0	1740	771.800	1.900	3.56	3.60	162.	92.	76.	7.0	324.	48.
	100.0	1750	781.315	2.000	3.76	3.80	162.	94.	78.	7.5	322.	48.
	110.0	1800	793.000	1.900	3.55	3.60	166.	94.	76.	7.0	320.	54.
	120.0	1810	803.637	1.900	3.60	3.60	163.	95.	80.	8.0	322.	64.
TOTALS	120.0		119.891									
AVERAGE					3.31	3.33	163.	86.	75.	6.0	319.	45.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS: MONGO POWER PLEASANTS

TEST TEAM LEADER: CLARKE

TEST 6DM5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/01/82	12/01/82
TB	TIME-START	1545	1545
TF	TIME-FINISH	1810	1810
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.998	.998
DN	SAMPLING NOZZLE DIAMETER	.221 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.33 IN-H2O	84.7 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	119.891 CU-FT	3.395 CU-M
TM	AVERAGE GAS METER TEMP	80.4 F	26.9 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	114.812 SCF	3.251 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	352.9	352.9
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	16.611 SCF	.470 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.64	12.64
FMO	MOLE FRACTION DRY GAS	.874	.874
PCO2	PERCENT CO2 BY VOL., DRY	12.75	12.75
PO2	PERCENT O2 BY VOL., DRY	5.70	5.70
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.55	81.55
MD	MOLECULAR WT-DRY STACK GAS	30.27	30.27
MWS	MOLECULAR WT-STACK GAS	28.72	28.72

PB	BAROMETRIC PRESSURE	29.14	IN-HG	740.16	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.03	IN-HG	737.35	MM-HG
TS	AVERAGE STACK TEMP	163.	F	73.	C
VS	AVG STACK GAS VELOCITY	82.8	FPS	25.3	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	67304912.	SCFH	1905875.	SCMH
QS	ACTUAL STACK FLOW RATE	93692672.	ACFH	2653096.	ACMH
ISO	PERCENT ISOKINETIC	100.6		100.6	
MN	FILTERABLE PART MG. EPA 5	88.8		88.8	
CS	FILTERABLE PART	.0119	GR/DSCF*	27.316	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	114.763	LB/HR	52.06	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	3960.0		3960.0	
CS	SULFUR DIOXIDE	.5322	GR/DSCF*	1218.157	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5117.790	LB/HR	2321.43	KG/HR
MN	SULFURIC ACID MG. EPA 5	62.6		62.6	
CS	SULFURIC ACID	.0084	GR/DSCF*	19.257	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	80.902	LB/HR	36.70	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 80M5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 119.891 * .998 * (29.14 + 5.333 / 13.6)}{(80. + 460.)} = 114.812 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 353. = 16.61 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 16.61}{114.812 + 16.61} = 12.64 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FWD = (100. - BWO) / 100.

$$FWD = \frac{100. - 12.6}{100.} = .874$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.75*44/100) + (5.7*32/100) + ((81.6+ .0) * 28/100 = 30.27

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.27* (1. -(12.64/100)) + 18. * (12.64/100) = 28.72

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 399.700 / (SQRT(28.72 * 29.03) * 12. = 82.84 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 82.84 * 45234. 3600/144 = 93692672. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 93692672. * 29.03 * (1. - (12.64/100))}{(163. + 460.)} = 67304912. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.56*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB*(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.56*(163.+460.))*((0.002669* 353.)+(119.891* .998*(29.14+(3.333/13.6))/(80.+460.)))}{120. * 82.84 * 29.03 * .221 * .221} = 100.60 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 88.8 * 15.43 / 114.812 = .0119 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0119 * 67304912. / (15.43 * 453.6) = 114.763

FIELD DATA

PLANT	MONO POWER-PLEASANTS	DATE	12/02/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	9AM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	DD	NOZZLE d-11 : I.D.	.222
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.33	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB4
FILTER NUMBER(S)	0002711	METER HEAD DIFF.	1.87
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	320.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.			
LEAKAGE	.006 CFM @ 7.0 IN.HG		
METER CALIB. FACTOR	1.037		
READ & RECORD DATA EVERY 10.0 MINUTES			

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	931	96.377									
	10.0	0	105.650	1.800	3.30	3.30	165.	60.	60.	5.7	315.	41.
	20.0	0	115.120	1.900	3.49	3.49	166.	63.	60.	6.3	327.	40.
	30.0	0	124.490	1.800	3.32	3.32	166.	68.	60.	6.2	334.	61.
	40.0	0	133.720	1.700	3.15	3.15	168.	73.	62.	5.8	335.	79.
	50.0	0	143.240	1.800	3.35	3.35	166.	75.	63.	6.2	338.	73.
	60.0	0	152.930	1.900	3.54	3.54	168.	77.	65.	6.3	338.	70.
	70.0	0	162.450	1.800	3.35	3.35	169.	78.	67.	5.9	340.	68.
	80.0	0	172.130	1.900	3.55	3.55	169.	79.	67.	6.2	338.	65.
	90.0	0	181.650	1.800	3.34	3.34	174.	79.	69.	5.9	333.	61.
	100.0	0	191.290	1.900	3.50	3.50	174.	80.	69.	6.1	319.	57.
	110.0	0	200.680	1.800	3.28	3.28	186.	80.	70.	5.8	314.	54.
	120.0	1131	210.393	1.900	3.54	3.54	173.	81.	71.	6.2	326.	54.
TOTALS	120.0		114.016									
AVERAGE					3.39	3.39	171.	74.	65.	6.0	330.	60.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONO POWER-PLEASANTS | DD

TEST 9AM58 UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/02/82	12/02/82
TB	TIME-START	931	931
TF	TIME-FINISH	1131	1131
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.037	1.037
DN	SAMPLING NOZZLE DIAMETER	.222 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.39 IN-H2O	86.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	114.016 CU-FT	3.229 CU-M
TM	AVERAGE GAS METER TEMP	69.8 F	21.0 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	116.484 SCF	3.298 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	343.1	343.1
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	16.150 SCF	.457 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.18	12.18
FMD	MOLE FRACTION DRY GAS	.878	.878
PCO2	PERCENT CO2 BY VOL., DRY	12.90	12.90
PO2	PERCENT O2 BY VOL., DRY	5.75	5.75
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.35	81.35
MD	MOLECULAR WT-DRY STACK GAS	30.29	30.29
MWS	MOLECULAR WT-STACK GAS	28.80	28.80

PB	BAROMETRIC PRESSURE	29.33	IN-HG	744.98	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.22	IN-HG	742.16	MM-HG
TS	AVERAGE STACK TEMP	171.	F	77.	C
VS	AVG STACK GAS VELOCITY	84.2	FPS	25.7	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	68347248.	SCFM	1935389.	SCMM
QS	ACTUAL STACK FLOW RATE	95196112.	ACFM	2695869.	ACMM
ISO	PERCENT ISOKINETIC	99.6		99.6	
MN	FILTERABLE PART MG. EPA 5	57.1		57.1	
CS	FILTERABLE PART	.0076	GR/DSCF*	17.313	MG/DSCM
PMN	FILTERABLE PART EMISSION RATE	73.861	LB/HR	33.50	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4310.0		4310.0	
CS	SULFUR DIOXIDE	.5709	GR/DSCF*	1306.790	MG/DSCM
PMN	SULFUR DIOXIDE EMISSION RATE	5575.181	LB/HR	2528.90	KG/HR
MN	SULFURIC ACID MG. EPA 5	87.8		87.8	
CS	SULFURIC ACID	.0116	GR/DSCF*	26.621	MG/DSCM
PMN	SULFURIC ACID EMISSION RATE	113.573	LB/HR	51.52	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 9AM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 114.016 * 1.037 * (29.33 + 3.392 / 13.6)}{(70. + 460.)} = 116.484 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 343. = 16.15 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 16.15}{116.484 + 16.15} = 12.18 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.2}{100.} = .878$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.90*44/100) + (5.8*32/100) + ((81.4+ .0) * 28/100 = 30.29

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.29* (1. -(12.18/100)) + 18. * (12.18/100) = 28.80

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 408.005 / (SQRT(28.80 * 29.22) * 12. = 84.17 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 84.17 * 45239. 3600/144 = 95196112. ACFH

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 95196112. * 29.22 * (1. - (12.18/100))}{(171. + 460.)} = 68347248. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(171.+460.))*((0.002669* 343.)+(114.016*1.037*(29.33+(3.392/13.6))/(70.+460.)))}{120. * 84.17 * 29.22 * .222 * .222} = 99.60 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 57.1 * 15.43 / 116.464 = .0076 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0076 * 68347248. / (15.43 * 453.6) = 73.861

FIELD DATA

PLANT	MUAD POWER-PLEASANTS	DATE	12/02/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	9BM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	UU	NOZZLE 2-10 : 1.0.	.221
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.33	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB8
FILTER NUMBER(S)		METER HEAD DIFF.	1.90
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	320.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.			
LEAKAGE	.008 CFM @ 9.0 IN.HG		
METER CALIB. FACTOR	.998		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	932	839.988									
	10.0	U	849.490	1.800	3.30	3.30	165.	57.	56.	7.3	324.	41.
	20.0	U	859.240	1.900	3.49	3.49	166.	60.	56.	7.9	338.	39.
	30.0	U	868.790	1.860	3.32	3.32	166.	65.	57.	7.8	331.	44.
	40.0	U	878.180	1.700	3.15	3.15	168.	69.	58.	7.5	326.	52.
	50.0	U	887.800	1.800	3.35	3.35	166.	71.	60.	7.8	320.	54.
	60.0	U	897.670	1.900	3.54	3.54	168.	73.	61.	8.2	319.	55.
	70.0	U	907.350	1.800	3.35	3.35	169.	74.	63.	7.8	324.	62.
	80.0	U	917.240	1.900	3.55	3.55	169.	74.	64.	8.2	333.	66.
	90.0	U	926.930	1.800	3.34	3.34	174.	75.	65.	8.0	338.	66.
	100.0	U	936.770	1.900	3.50	3.50	179.	76.	66.	8.2	334.	69.
	110.0	U	946.400	1.800	3.28	3.28	186.	76.	67.	7.9	339.	65.
	120.0	1132	956.299	1.900	3.54	3.54	173.	77.	67.	8.3	339.	65.
TOTALS	120.0		116.311									
AVERAGE					3.39	3.39	171.	71.	62.	7.9	330.	57.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONO POWER-PLEASANTS | DD

TEST 9BM5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/02/82	12/02/82
TB	TIME-START	932	932
TF	TIME-FINISH	1132	1132
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.998	.998
DN	SAMPLING NOZZLE DIAMETER	.221 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.39 IN-H2O	86.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	116.311 CU-FT	3.294 CU-M
TM	AVERAGE GAS METER TEMP	66.1 F	19.0 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	115.166 SCF	3.261 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	351.8	351.8
VWS	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	16.559 SCF	.469 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.57	12.57
FMO	MOLE FRACTION DRY GAS	.874	.874
PCO2	PERCENT CO2 BY VOL., DRY	12.90	12.90
PO2	PERCENT O2 BY VOL., DRY	5.75	5.75
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.35	81.35
MD	MOLECULAR WT-DRY STACK GAS	30.29	30.29
MWS	MOLECULAR WT-STACK GAS	28.75	28.75

PB	BAROMETRIC PRESSURE	29.33	IN-HG	744.98	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.22	IN-HG	742.18	MM-HG
TS	AVERAGE STACK TEMP	171.	F	77.	C
VS	AVG STACK GAS VELOCITY	84.2	FPS	25.7	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	8809736O.	SCFH	1928513.	SCMH
QS	ACTUAL STACK FLOW RATE	9527643O.	ACFH	2697943.	ACMH
ISO	PERCENT ISOKINETIC	99.7		99.7	
MN	FILTERABLE PART MG. EPA 5	58.2		58.2	
CS	FILTERABLE PART	.0078	GR/DSCF*	17.848	MG/DSCM
PMN	FILTERABLE PART EMISSION RATE	75.068	LB/HR	34.41	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4270.0		4270.0	
CS	SULFUR DIOXIDE	.5721	GR/DSCF*	1309.482	MG/DSCM
PMN	SULFUR DIOXIDE EMISSION RATE	5506.241	LB/HR	2524.85	KG/HR
MN	SULFURIC ACID MG. EPA 5	101.0		101.0	
CS	SULFURIC ACID	.0135	GR/DSCF*	30.974	MG/DSCM
PMN	SULFURIC ACID EMISSION RATE	131.661	LB/HR	59.72	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO. 98M5H

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 116.311 * .998 * (29.33 + 3.592 / 13.6)}{(66. + 460.)} = 115.166 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 352. = 16.56 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 16.56}{115.166 + 16.56} = 12.57 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 12.6}{100.} = .874$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.90*44/100) + (5.8*32/100) + ((81.4+ .0) * 28/100 = 30.29

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.29* (1. -(12.57/100)) + 18. * (12.57/100) = 28.75

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 408.005 / (SQRT(28.75 * 29.22) * 12. = 84.24 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 84.24 * 45239. 3600/144 = 95276432. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 95276432. * 29.22 * (1. - (12.57/100))}{(171. + 460.)} = 68097360. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DA)

$$ISO = \frac{(305.58*(171.+460.))*((0.002669* 352.)+(116.311* .998*(29.33+(3.392/13.6))/(66.+460.)))}{120. * 84.24 * 29.22 * .221 * .221} = 99.73 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 58.2 * 15.43 / 115.166 = .0078 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PHR = CS * QSSTD / (15.43 * 453.6)

PHR = .0078 * 68097360. / (15.43 * 453.6) = 75.868

FIELD DATA

PLANT	MONGO POWER PLEASANTS	DATE	12/02/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	9CM58P
SAMPLE TYPE	M5B-P400	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	CLARKE	NOZZLE 2-09: I.D.	.220
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.33	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB8
FILTER NUMBER(S)	0002713	METER HEAD DIFF.	2.00
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	400.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.000 CFM @ 9.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	1.006		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	930	95.666									
	10.0	940	102.600	1.800	3.20	3.20	165.	60.	60.	8.0	318.	56.
	20.0	950	111.398	1.900	3.38	3.40	166.	63.	58.	8.5	324.	40.
	30.0	1000	121.525	1.800	3.20	3.20	166.	70.	58.	8.0	314.	44.
	40.0	1010	131.246	1.700	3.00	3.10	168.	78.	69.	8.0	319.	64.
	50.0	1020	139.320	1.800	3.20	3.30	166.	80.	62.	8.0	326.	64.
	60.0	1030	149.365	1.900	3.44	3.40	168.	82.	62.	8.0	314.	60.
	70.0	1040	159.555	1.800	3.30	3.30	169.	84.	64.	8.0	319.	58.
	80.0	1050	168.666	1.900	3.46	3.50	169.	86.	65.	8.0	325.	56.
	90.0	1100	178.820	1.800	3.25	3.30	174.	86.	65.	8.0	316.	52.
	100.0	1110	187.845	1.900	3.40	3.40	179.	87.	68.	8.0	319.	55.
	110.0	1120	197.677	1.800	3.20	3.20	186.	88.	67.	8.0	327.	56.
	120.0	1130	207.159	1.900	3.50	3.50	173.	89.	68.	8.0	320.	52.
TOTALS	120.0		113.493									
AVERAGE					3.30	3.32	171.	79.	64.	8.0	320.	55.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS

MONGO POWER PLEASANTS

TEST TEAM LEADER

CLARKE

TEST 9CM5BP UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/02/82	12/02/82
TB	TIME-START	930	930
TF	TIME-FINISH	1130	1130
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.006	1.006
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.32 IN-H2O	84.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	113.493 CU-FT	3.214 CU-M
TM	AVERAGE GAS METER TEMP	71.6 F	22.0 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	112.083 SCF	3.174 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	541.4	541.4
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	16.070 SCF	.455 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.54	12.54
FMD	MOLE FRACTION DRY GAS	.875	.875
PCO2	PERCENT CO2 BY VOL., DRY	12.90	12.90
PO2	PERCENT O2 BY VOL., DRY	5.75	5.75
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.35	81.35
MD	MOLECULAR WT-DRY STACK GAS	30.29	30.29
MWS	MOLECULAR WT-STACK GAS	28.75	28.75

PB	BAROMETRIC PRESSURE	29.53	IN-HG	749.98	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.22	IN-HG	742.18	MM-HG
TS	AVERAGE STACK TEMP	171.	F	77.	C
VS	AVG STACK GAS VELOCITY	84.2	FPS	25.7	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	68117344.	SCFH	1928879.	SCMH
QS	ACTUAL STACK FLOW RATE	95269984.	ACFH	2697760.	ACMH
ISO	PERCENT ISOKINETIC	97.9		97.9	
MN	FILTERABLE PART MG. EPA 5	31.6		31.6	
CS	FILTERABLE PART	.0044	GR/DSCF*	9.957	MG/DSCM
PMN	FILTERABLE PART EMISSION RATE	42.338	LB/HR	19.20	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4170.0		4170.0	
CS	SULFUR DIOXIDE	.5741	GR/DSCF*	1313.984	MG/DSCM
PMN	SULFUR DIOXIDE EMISSION RATE	5587.018	LB/HR	2534.27	KG/HR
MN	SULFURIC ACID MG. EPA 5	98.8		98.8	
CS	SULFURIC ACID	.0136	GR/DSCF*	31.132	MG/DSCM
PMN	SULFURIC ACID EMISSION RATE	132.373	LB/HR	60.04	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.9CM5BP

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 113.493 * 1.006 * (29.33 + 3.317 / 13.6)}{(72. + 460.)} = 112.083 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 341. = 16.07 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 16.07}{112.083 + 16.07} = 12.54 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMO = (100. - BWO) / 100.

$$FMO = \frac{100. - 12.5}{100.} = .875$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MO = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MO = (12.90*44/100) + (5.8*32/100) + ((81.4+ .0) * 28/100 = 30.29

MOLECULAR WEIGHT OF STACK GAS

MWS = MO * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.29* (1. -(12.54/100)) + 18. * (12.54/100) = 28.75

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 408.005 / (SQRT(28.75 * 29.22) * 12. = 84.24 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 84.24 * 45239. 3600/144 = 95269984. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 95269984. * 29.22 * (1. - (12.54/100))}{(171. + 460.)} = 68117344. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB*(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(171.+460.))*((0.002669*341.)+(113.495*1.006*(29.33+(3.317/13.6))/(72.+460.)))}{120. * 84.24 * 29.22 * .220 * .220} = 97.92 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 31.6 * 15.43 / 112.083 = .0044 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0044 * 68117344. / (15.43 * 453.6) = 42.338

FIELD DATA

PLANT	MORGO POWER PLEASANTS	DATE	12/02/82
SAMPLING LOCATION	UNIT 1 OUTLET	RUN NUMBER	90M58P
SAMPLE TYPE	M5B-P400	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	CLARKE	NOZZLE 2-12: 1.0.	.220
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.33	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB5
FILTER NUMBER(S)	0002714	METER HEAD DIFF.	1.95
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	400.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.004 CFM @ 9.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	.986		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	930	815.288									
	10.0	940	824.800	1.800	3.20	3.20	165.	63.	63.	8.0	321.	52.
	20.0	950	833.750	1.900	3.40	3.40	166.	68.	64.	8.0	323.	40.
	30.0	1000	844.725	1.800	3.20	3.30	166.	76.	64.	8.0	318.	38.
	40.0	1010	853.387	1.700	3.10	3.10	168.	84.	66.	7.0	325.	58.
	50.0	1020	866.826	1.800	3.30	3.30	166.	87.	69.	7.5	320.	56.
	60.0	1030	872.929	1.900	3.50	3.50	168.	89.	71.	8.0	322.	46.
	70.0	1040	884.244	1.800	3.30	3.30	169.	91.	73.	8.0	317.	48.
	80.0	1050	893.749	1.900	3.50	3.50	169.	92.	74.	8.0	321.	56.
	90.0	1100	904.265	1.800	3.30	3.30	174.	92.	75.	7.5	317.	58.
	100.0	1110	913.660	1.900	3.50	3.50	179.	93.	77.	8.0	325.	55.
	110.0	1120	924.924	1.800	3.30	3.30	180.	95.	78.	8.0	320.	58.
	120.0	1130	935.158	1.900	3.50	3.50	173.	97.	79.	8.0	319.	56.
TOTALS	120.0		119.870									
AVERAGE					3.35	3.35	171.	86.	71.	7.8	321.	52.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MONGO POWER PLEASANTS — CLARKE

TEST 90M58P — UNIT 1 OUTLET

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/02/82	12/02/82
TB	TIME-START	930	930
TF	TIME-FINISH	1130	1130
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.988	.988
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PP	AVERAGE ORIFICE PRESSURE DROP	3.35 IN-H2O	85.1 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	119.870 CU-FT	3.394 CU-M
TM	AVERAGE GAS METER TEMP	78.3 F	25.7 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	114.824 SCF	3.251 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	360.9	360.9
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	16.986 SCF	.481 SCM
BWO	PERCENT MOISTURE BY VOLUME	12.89	12.89
FMD	MOLE FRACTION DRY GAS	.871	.871
PCO2	PERCENT CO2 BY VOL., DRY	12.90	12.90
PO2	PERCENT O2 BY VOL., DRY	5.75	5.75
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.35	81.35
MD	MOLECULAR WT-DRY STACK GAS	30.29	30.29
MWS	MOLECULAR WT-STACK GAS	28.71	28.71

PB	BAROMETRIC PRESSURE	29.33	IN-HG	744.98	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.22	IN-HG	742.18	MM-HG
TS	AVERAGE STACK TEMP	171.	F	77.	C
VS	AVG STACK GAS VELOCITY	84.3	FPS	25.7	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	6789624.	SCFM	1922629.	SCMM
QS	ACTUAL STACK FLOW RATE	9534100.	ACFM	2699772.	ACMM
ISO	PERCENT ISOKINETIC	100.6		100.6	
MN	FILTERABLE PART MG. EPA 5	39.0		39.0	
CS	FILTERABLE PART	.0052	GR/DSCF*	11.996	MG/DSCM
PPH	FILTERABLE PART EMISSION RATE	50.840	LB/HR	23.06	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4290.0		4290.0	
CS	SULFUR DIOXIDE	.5765	GR/DSCF*	1319.535	MG/DSCM
PPH	SULFUR DIOXIDE EMISSION RATE	5592.439	LB/HR	2536.73	KG/HR
MN	SULFURIC ACID MG. EPA 5	85.6		85.6	
CS	SULFURIC ACID	.0115	GR/DSCF*	26.329	MG/DSCM
PPH	SULFURIC ACID EMISSION RATE	111.588	LB/HR	50.62	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.90M50P

UNIT 1 OUTLET

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (Pb + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 119.870 * .988 * (29.33 + 5.550 / 13.6)}{(78. + 460.)} = 114.824 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VwC = .04707 * VLC

VwC = .04707 * 361. = 16.99 SCF

PERCENT MOISTURE IN STACK GAS

BwO = (100. * VwC) / (VMSTD + VwC)

$$BwO = \frac{100. * 16.99}{114.824 + 16.99} = 12.89 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BwO) / 100.

$$FMD = \frac{100. - 12.9}{100.} = .871$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.90*44/100) + (5.8*32/100) + ((81.4+ .0) * 28/100 = 30.29

MOLECULAR WEIGHT OF STACK GAS

MwS = MD * (1. - (BwO/100)) + 18. * (BwO/100)

MwS = 30.29* (1. -(12.89/100)) + 18. * (12.89/100) = 28.71

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PAIS)

VS = 85.49 * .84 * 408.005 / (SQRT(28.71 * 29.22) * 12. = 84.30 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 84.30 * 45239. 3600/144 = 95341008. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 95341008. * 29.22 * (1. - (12.89/100))}{(171. + 460.)} = 67896624. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(171.+460.))*((0.002669* 361.)+(119.870* .988*(29.33+(3.350/13.6))/(78.+460.)))}{120. * 84.30 * 29.22 * .220 * .220} = 100.64 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 59.0 * 15.43 / 114.824 = .0052 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0052 * 67896624. / (15.43 * 453.6) = 50.840

FIELD DATA

PLANT	MORO POWER-PLEASANTS		
SAMPLING LOCATION	UNIT 1		
		DATE	12/02/82
		RUN NUMBER	10AM58
SAMPLE TYPE	M5B		
OPERATOR	DD		
AMBIENT TEMP.(DEG.F)	65.	PROBE LENGTH & TYPE	6' GLASS
BAR.PRESS.(IN.HG)	29.38	NOZZLE 2-03 : I.D.	.219
STATIC PRESS.(IN.H2O)	-1.50	ASSUMED MOISTURE	12.0
FILTER NUMBER(S)	0002715	SAMPLE BOX NUMBER	
STACK INSIDE DIM.(IN)	240.00 .00	METER BOX NUMBER	FB4
PITOT TUBE COEFF.	.84	METER HEAD DIFF.	1.87
THERM. NO.			
LEAKAGE	.008 CFM @ 7.0 IN.HG	PROBE HEATER SETTING	320.
METER CALIB. FACTOR	1.037	HEATER BOX SETTING	320.
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1304	211.623									
	10.0	0	221.200	1.900	3.40	3.40	166.	68.	67.	5.1	344.	57.
	20.0	0	230.690	1.900	3.39	3.39	170.	71.	67.	5.1	334.	45.
	30.0	0	240.020	1.800	3.24	3.24	168.	76.	68.	4.9	340.	45.
	40.0	0	249.760	2.000	3.61	3.61	169.	79.	69.	5.3	337.	47.
	50.0	0	259.360	1.900	3.42	3.42	172.	80.	70.	5.2	336.	46.
	60.0	0	269.140	2.000	3.61	3.61	170.	81.	71.	5.6	329.	51.
	70.0	0	278.940	2.000	3.65	3.65	170.	82.	72.	5.8	332.	54.
	80.0	0	288.560	1.900	3.44	3.44	171.	83.	73.	5.5	338.	59.
	90.0	0	297.940	1.800	3.33	3.33	160.	85.	74.	5.2	337.	63.
	100.0	0	307.620	1.900	3.49	3.49	164.	85.	75.	5.7	336.	66.
	110.0	0	317.560	2.000	3.69	3.69	170.	87.	76.	6.0	333.	72.
	120.0	1504	327.698	2.100	3.86	3.86	167.	87.	77.	6.3	331.	75.
TOTALS	120.0		116.075									
AVERAGE					3.51	3.51	168.	80.	72.	5.5	336.	57.

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PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS — TEST TEAM LEADER

MONO POWER-PLEASANTS — DD

TEST 1DAM5d — UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/02/82	12/02/82
TB	TIME-START	1304	1304
TF	TIME-FINISH	1504	1504
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.037	1.037
DN	SAMPLING NOZZLE DIAMETER	.219 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.51 IN-H2O	89.1 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	116.075 CU-FT	3.287 CU-M
TM	AVERAGE GAS METER TEMP	76.0 F	24.4 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	117.464 SCF	3.326 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	380.3	380.3
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	17.901 SCF	.507 SCM
BWO	PERCENT MOISTURE BY VOLUME	13.22	13.22
FMD	MOLE FRACTION DRY GAS	.868	.868
PCO2	PERCENT CO2 BY VOL., DRY	12.60	12.60
PO2	PERCENT O2 BY VOL., DRY	6.05	6.05
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.35	81.35
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	28.64	28.64

PB	BAROMETRIC PRESSURE	29.38	IN-HG	746.25	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.27	IN-HG	743.45	MM-HG
TS	AVERAGE STACK TEMP	168.	F	76.	C
VS	AVG STACK GAS VELOCITY	86.4	FPS	26.3	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	69744608.	SCFM	1974958.	SCMM
QS	ACTUAL STACK FLOW RATE	97732544.	ACFM	2767493.	ACMM
ISO	PERCENT ISOKINETIC	101.1		101.1	
MN	FILTERABLE PART MG. EPA 5	45.0		45.0	
CS	FILTERABLE PART	.0059	GR/DSCF*	13.530	MG/DSCM
PMN	FILTERABLE PART EMISSION RATE	58.904	LB/HR	26.72	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4300.0		4300.0	
CS	SULFUR DIOXIDE	.5648	GR/DSCF*	1292.875	MG/DSCM
PMN	SULFUR DIOXIDE EMISSION RATE	5628.590	LB/HR	2553.13	KG/HR
MN	SULFURIC ACID MG. EPA 5	92.0		92.0	
CS	SULFURIC ACID	.0121	GR/DSCF*	27.662	MG/DSCM
PMN	SULFURIC ACID EMISSION RATE	120.426	LB/HR	54.63	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.10AM5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 116.075 * 1.037 * (29.98 + 5.509 / 13.6)}{(70. + 460.)} = 117.464 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 380. = 17.90 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 17.90}{117.464 + 17.90} = 13.22 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 13.2}{100.} = .868$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.00*.44/100) + (6.1*32/100) + ((81.4+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26 * (1. -(13.22/100)) + 18. * (13.22/100) = 28.04

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(Vh * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 418.068 / (SQRT(28.64 * 29.27) * 12. = 86.41 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 86.41 * 45239. 3600/144 = 97732544. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QsSTD = \frac{17.647 * 97732544. * 29.27 * (1. - (13.22/100))}{(168. + 460.)} = 69744608. \text{ SCFH}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(168.+460.))*((0.002669* 380.)+(116.075*1.037*(29.38+(3.509/13.6))/(70.+460.)))}{120. * 86.41 * 29.27 * .219 * .219} = 101.14 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

Cs = 0.001 * 45.0 * 15.43 / 117.464 = .0059 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0059 * 69744608. / (15.43 * 453.6) = 58.904

FIELD DATA

PLANT	MORO POWER-PLEASANTS	DATE	12/02/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	10BM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	DD	NOZZLE I.D.	.220
AMBIENT TEMP.(DEG.F)	65.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.38	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB8
FILTER NUMBER(S)	0002716	METER HEAD DIFF.	1.90
STACK INSIDE DIM.(IN)	240.00 .00	PROBE HEATER SETTING	320.
PITOT TUBE COEFF.	.84	HEATER BOX SETTING	320.
THERM. NO.			
LEAKAGE	.006 CFM @ 8.0 IN.HG		
METER CALIB. FACTOR	.998		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1305	956.543									
	10.0	0	966.280	1.900	3.40	3.40	166.	65.	64.	5.9	341.	58.
	20.0	0	975.940	1.900	3.39	3.39	170.	68.	64.	6.1	341.	47.
	30.0	0	985.520	1.800	3.24	3.24	168.	72.	65.	6.1	330.	45.
	40.0	0	995.530	2.000	3.61	3.61	169.	76.	66.	6.6	334.	49.
	50.0	0	5.360	1.900	3.42	3.42	172.	77.	67.	6.4	338.	52.
	60.0	0	15.420	2.000	3.61	3.61	170.	78.	68.	6.7	327.	56.
	70.0	0	25.490	2.000	3.63	3.63	170.	78.	69.	6.8	327.	55.
	80.0	0	35.370	1.900	3.44	3.44	171.	80.	70.	6.6	338.	58.
	90.0	0	45.070	1.800	3.33	3.33	160.	81.	71.	6.5	340.	62.
	100.0	0	55.010	1.900	3.49	3.49	164.	82.	73.	6.8	329.	64.
	110.0	0	65.200	2.000	3.69	3.69	170.	83.	73.	7.0	333.	67.
	120.0	1505	75.570	2.100	3.86	3.86	167.	83.	74.	7.3	341.	69.
TOTALS	120.0		119.027									
AVERAGE					3.51	3.51	168.	77.	69.	6.6	335.	57.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONO POWER-PLEASANTS | DD

TEST 10BM5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/02/82	12/02/82
TB	TIME-START	1305	1305
TF	TIME-FINISH	1505	1505
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.998	.998
DN	SAMPLING NOZZLE DIAMETER	.220 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.51 IN-H2O	89.1 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	119.027 CU-FT	3.370 CU-M
TM	AVERAGE GAS METER TEMP	72.8 F	22.7 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	116.611 SCF	3.302 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	372.2	372.2
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	17.519 SCF	.496 SCM
BWO	PERCENT MOISTURE BY VOLUME	13.06	13.06
FWO	MOLE FRACTION DRY GAS	.869	.869
PCO2	PERCENT CO2 BY VOL., DRY	12.60	12.60
PO2	PERCENT O2 BY VOL., DRY	6.05	6.05
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.35	81.35
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	28.66	28.66

PB	BAROMETRIC PRESSURE	29.58	IN-HG	746.25	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.27	IN-HG	743.45	MM-HG
TS	AVERAGE STACK TEMP	168.	F	76.	C
VS	AVG STACK GAS VELOCITY	86.4	FPS	26.3	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	69850920.	SCFM	1977969.	SCMM
QS	ACTUAL STACK FLOW RATE	97698560.	ACFM	2766530.	ACMM
ISO	PERCENT ISOKINETIC	99.3		99.3	
MN	FILTERABLE PART MG. EPA 5	38.5		38.5	
CS	FILTERABLE PART	.0051	GR/DSCF*	11.660	MG/DSCM
PMR	FILTERABLE PART EMISSION RATE	50.642	LB/HR	23.06	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4210.0		4210.0	
CS	SULFUR DIOXIDE	.5571	GR/DSCF*	1275.081	MG/DSCM
PMR	SULFUR DIOXIDE EMISSION RATE	5559.583	LB/HR	2521.83	KG/HR
MN	SULFURIC ACID MG. EPA 5	104.0		104.0	
CS	SULFURIC ACID	.0138	GR/DSCF*	31.498	MG/DSCM
PMR	SULFURIC ACID EMISSION RATE	137.339	LB/HR	62.30	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.10BP5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 119.027 * .998 * (29.38 + 3.509 / 13.6)}{(75. + 460.)} = 116.611 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 372. = 17.52 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 17.52}{116.611 + 17.52} = 13.06 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 13.1}{100.} = .869$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.60*44/100) + (6.1*32/100) + ((81.4+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26* (1. -(13.06/100)) + 18. * (13.06/100) = 28.66

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STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PATS)

VS = 85.49 * .84 * 418.068 / (SQRT(28.66 * 29.27) * 12. = 86.38 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 86.38 * 45239. 3600/144 = 97698560. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 97698560. * 29.27 * (1. - (13.06/100))}{(168. + 460.)} = 69850928. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.56*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DA)

$$ISO = \frac{(305.56*(168.+460.))*((0.002669* 372.)+(119.027* .998*(29.38+(3.509/13.6))/(73.+460.)))}{120. * 86.38 * 29.27 * .220 * .220} = 99.35 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 38.5 * 15.43 / 116.611 = .0051 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0051 * 69850928. / (15.43 * 453.6) = 50.842

FIELD DATA

PLANT	MONGO POWER PLEASANTS	DATE	12/02/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	10CM5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	5' GLASS
OPERATOR	CLARKE	NOZZLE [illegible]: I.D.	.219
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.38	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB3
FILTER NUMBER(S)	0002717	METER HEAD DIFF.	2.00
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.012 CFM @ 10.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	1.006		

READ & RECORD DATA EVERY 10.0 MINUTES

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1300	207.427									
	10.0	1310	217.190	1.900	3.40	3.40	166.	66.	66.	6.5	326.	52.
	20.0	1320	226.417	1.900	3.40	3.40	170.	72.	66.	6.5	308.	54.
	30.0	1330	235.595	1.800	3.20	3.20	168.	79.	68.	6.0	316.	46.
	40.0	1340	245.940	2.000	3.65	3.70	169.	83.	69.	7.0	317.	46.
	50.0	1350	255.555	1.900	3.46	3.50	172.	87.	69.	7.0	318.	50.
	60.0	1400	265.450	2.000	3.67	3.70	170.	89.	70.	7.5	316.	50.
	70.0	1410	275.325	2.000	3.70	3.70	170.	90.	71.	7.0	313.	54.
	80.0	1420	285.635	1.900	3.50	3.50	171.	91.	71.	7.0	313.	52.
	90.0	1430	294.464	1.800	3.36	3.40	160.	91.	71.	7.0	316.	56.
	100.0	1440	304.625	1.900	3.50	3.50	164.	92.	73.	7.5	313.	56.
	110.0	1450	314.144	2.000	3.70	3.70	170.	92.	73.	7.5	313.	54.
	120.0	1500	324.450	2.100	3.89	3.90	167.	93.	73.	8.5	319.	58.
TOTALS	120.0		117.023									
AVERAGE					3.54	3.55	168.	85.	70.	7.1	315.	53.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS: MONGO POWER PLEASANTS

TEST TEAM LEADER: CLARKE

TEST 10CM5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/02/82	12/02/82
TB	TIME-START	1300	1300
TF	TIME-FINISH	1500	1500
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	1.006	1.006
DN	SAMPLING NOZZLE DIAMETER	.219 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.55 IN-H2O	90.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	117.023 CU-FT	3.314 CU-M
TM	AVERAGE GAS METER TEMP	77.7 F	25.4 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	114.521 SCF	3.243 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL,ML.	375.5	375.5
VWL	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	17.675 SCF	.500 SCM
BWO	PERCENT MOISTURE BY VOLUME	13.37	13.37
FMO	MOLE FRACTION DRY GAS	.866	.866
PCO2	PERCENT CO2 BY VOL., DRY	12.60	12.60
PO2	PERCENT O2 BY VOL., DRY	6.05	6.05
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.35	81.35
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	28.62	28.62

PB	BAROMETRIC PRESSURE	29.38	IN-HG	746.25	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.27	IN-HG	743.45	MM-HG
TS	AVERAGE STACK TEMP	168.	F	76.	C
VS	AVG STACK GAS VELOCITY	86.4	FPS	26.3	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	6964897a.	SCFM	1972250.	SCMM
QS	ACTUAL STACK FLOW RATE	9776a3120.	ACFM	2768359.	ACMM
ISO	PERCENT ISOKINETIC	98.7		98.7	
MN	FILTERABLE PART MG. EPA 5	85.4		85.4	
CS	FILTERABLE PART	.0115	GR/DSCF*	26.337	MG/DSCM
PMN	FILTERABLE PART EMISSION RATE	114.502	LB/HR	51.94	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4190.0		4190.0	
CS	SULFUR DIOXIDE	.5645	GR/DSCF*	1292.177	MG/DSCM
PMN	SULFUR DIOXIDE EMISSION RATE	5617.a36	LB/HR	2548.25	KG/HR
MN	SULFURIC ACID MG. EPA 5	75.8		75.8	
CS	SULFURIC ACID	.0102	GR/DSCF*	23.376	MG/DSCM
PMN	SULFURIC ACID EMISSION RATE	101.631	LB/HR	46.10	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.10CP5B

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 117.023 * 1.006 * (29.36 + 3.550 / 13.6)}{(78. + 460.)} = 114.521 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 376. = 17.67 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 17.67}{114.521 + 17.67} = 13.37 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FMD = (100. - BWO) / 100.

$$FMD = \frac{100. - 13.4}{100.} = .866$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.60*44/100) + (6.1*32/100) + ((81.4+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26* (1. -(13.37/100)) + 18. * (13.37/100) = 28.62

STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(MWS * PS) * PAIS)

VS = 85.49 * .84 * 418.068 / (SQRT(28.62 * 29.27) * 12. = 86.44 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 86.44 * 45239. 3600/144 = 97763120. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 97763120. * 29.27 * (1. - (13.37/100))}{(100. + 460.)} = 6964897b.\ SCFM$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DA)

$$ISO = \frac{(305.58*(100.+460.))*((0.002669* 376.)+(117.023*1.006*(29.38+(5.550/13.6))/(78.+460.)))}{120. * 86.44 * 29.27 * .219 * .219} = 98.75\ PERCENT$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 85.4 * 15.43 / 114.521 = .0115 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PHR = CS * QSSTD / (15.43 * 453.6)

PHR = .0115 * 6964897b. / (15.43 * 453.6) = 114.502

FIELD DATA

PLANT	MORGO POWER PLEASANTS	DATE	12/02/82
SAMPLING LOCATION	UNIT 1	RUN NUMBER	100M5B
SAMPLE TYPE	M5B	PROBE LENGTH & TYPE	6' GLASS
OPERATOR	CLARKE	NOZZLE 2-07: I.D.	.221
AMBIENT TEMP.(DEG.F)	60.	ASSUMED MOISTURE	12.0
BAR.PRESS.(IN.HG)	29.30	SAMPLE BOX NUMBER	
STATIC PRESS.(IN.H2O)	-1.50	METER BOX NUMBER	FB5
FILTER NUMBER(S)	0002718	METER HEAD DIFF.	1.97
STACK INSIDE DIM.(IN)	240.00 .00	C FACTOR	2.14
PITOT TUBE COEFF.	.84	PROBE HEATER SETTING	320.
THERM. NO.	201	HEATER BOX SETTING	320.
LEAKAGE	.004 CFM @ 10.0 IN.HG	REFERENCE PRESS. DIFF.	.00
METER CALIB. FACTOR	.988		
READ & RECORD DATA EVERY	10.0 MINUTES		

TRAVERSE POINT NO.	SAMPLE TIME (MIN.)	CLOCK TIME (24-HR CLOCK)	GAS METER READING (CU.FT.)	VELOCITY HEAD (IN.H2O)	ORIFICE PRESSURE DIFFERENTIAL (IN.H2O)		STACK TEMP (DEG.F)	DRY GAS METER TEMP (DEG.F)		PUMP VACUUM (IN.HG)	SAMPLE BOX TEMP (DEG.F)	IMPINGER TEMP (DEG.F)
					DESIRED	ACTUAL		INLET	OUTLET			
INIT	0	1300	935.684									
	10.0	1310	946.222	1.900	3.47	3.50	166.	74.	74.	8.0	320.	56.
	20.0	1320	956.820	1.900	3.45	3.50	170.	77.	73.	8.0	318.	42.
	30.0	1330	966.275	1.800	3.30	3.30	168.	85.	73.	7.5	301.	44.
	40.0	1340	976.340	2.000	3.70	3.70	169.	90.	75.	8.0	302.	48.
	50.0	1350	987.820	1.900	3.50	3.50	172.	95.	76.	8.0	305.	48.
	60.0	1400	997.601	2.000	3.70	3.70	170.	96.	78.	8.0	307.	52.
	70.0	1410	7.653	2.000	3.70	3.70	170.	98.	80.	8.0	309.	48.
	80.0	1420	18.780	1.900	3.50	3.50	171.	98.	80.	8.0	310.	54.
	90.0	1430	28.528	1.800	3.40	3.40	160.	99.	82.	8.0	310.	54.
	100.0	1440	38.758	1.900	3.60	3.60	164.	100.	84.	8.0	309.	56.
	110.0	1450	49.049	2.000	3.70	3.70	170.	100.	83.	8.0	308.	58.
	120.0	1500	60.981	2.100	4.00	4.00	167.	100.	85.	9.0	309.	62.
TOTALS	120.0		125.297									
AVERAGE					3.59	3.59	168.	93.	79.	8.0	309.	52.

PARTICULATE FIELD DATA & RESULTS TABULATION

PLANT- NAME AND ADDRESS | TEST TEAM LEADER

MONGO POWER PLEASANTS | CLARKE

TEST 100M5B UNIT 1

		ENGLISH UNITS	METRIC UNITS
TEST DATE		12/02/82	12/02/82
TB	TIME-START	1300	1300
TF	TIME-FINISH	1500	1500
TT	NET TIME OF TEST, MIN.	120.0	120.0
NP	NET SAMPLING POINTS	12	12
Y	METER CALIBRATION FACTOR	.986	.988
DN	SAMPLING NOZZLE DIAMETER	.221 IN	5.6 MM
CP	PITOT TUBE COEFFICIENT	.84	.84
PM	AVERAGE ORIFICE PRESSURE DROP	3.59 IN-H2O	91.2 MM-H2O
VM	VOLUME OF DRY GAS SAMPLED AT METER CONDITIONS	125.297 CU-FT	3.548 CU-M
TM	AVERAGE GAS METER TEMP	85.6 F	29.8 C
VMSTD	VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS*	118.369 SCF	3.352 SCM
VLC	TOTAL H2O COLLECTED IN IMPINGERS AND SILICA GEL, ML.	385.7	385.7
VWC	VOLUME OF WATER VAPOR AT STANDARD CONDITIONS*	18.155 SCF	.514 SCM
BWO	PERCENT MOISTURE BY VOLUME	13.30	13.30
FMD	MOLE FRACTION DRY GAS	.867	.867
PCO2	PERCENT CO2 BY VOL., DRY	12.60	12.60
PO2	PERCENT O2 BY VOL., DRY	6.05	6.05
PCO	PERCENT CO BY VOL., DRY	.00	.00
PN2	PERCENT N2 BY VOL., DRY	81.35	81.35
MD	MOLECULAR WT-DRY STACK GAS	30.26	30.26
MWS	MOLECULAR WT-STACK GAS	28.63	28.63

PB	BAROMETRIC PRESSURE	29.30	IN-HG	744.22	MM-HG
PSI	STATIC PRES OF STACK GAS	-1.50	IN-H2O	-38.10	MM-H2O
PS	STACK PRES, ABS.	29.19	IN-HG	741.42	MM-HG
TS	AVERAGE STACK TEMP	166.	F	76.	C
VS	AVG STACK GAS VELOCITY	86.5	FPS	26.4	MPS
AS	STACK AREA	45239.	SQ-IN	29.186	SQ-M
QSSTD	STACK FLOW RATE, DRY*	69600912.	SCFH	1970689.	SCMH
QS	ACTUAL STACK FLOW RATE	97881872.	ACFH	2771721.	ACMH
ISO	PERCENT ISOKINETIC	100.3		100.3	
MN	FILTERABLE PART MG. EPA 5	77.3		77.3	
CS	FILTERABLE PART	.0101	GR/DSCF*	23.069	MG/DSCM
PMH	FILTERABLE PART EMISSION RATE	100.203	LB/HR	45.45	KG/HR
MN	SULFUR DIOXIDE MG. EPA 5	4340.0		4340.0	
CS	SULFUR DIOXIDE	.5657	GR/DSCF*	1294.928	MG/DSCM
PMH	SULFUR DIOXIDE EMISSION RATE	5625.911	LB/HR	2551.91	KG/HR
MN	SULFURIC ACID MG. EPA 5	58.6		58.6	
CS	SULFURIC ACID	.0076	GR/DSCF*	17.405	MG/DSCM
PMH	SULFURIC ACID EMISSION RATE	75.963	LB/HR	34.46	KG/HR

* 68 DEG F, 29.92 IN.HG.

EXAMPLE PARTICULATE CALCULATIONS TEST NO.100PSB

UNIT 1

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS

VMSTD = (17.647 * VM * Y * (PB + PM / 13.6)) / (TM + 460.)

$$VMSTD = \frac{17.647 * 125.297 * .988 * (29.30 + 3.592 / 13.6)}{(86. + 460.)} = 118.369 \text{ DSCF}$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS

VWC = .04707 * VLC

VWC = .04707 * 386. = 18.15 SCF

PERCENT MOISTURE IN STACK GAS

BWO = (100. * VWC) / (VMSTD + VWC)

$$BWO = \frac{100. * 18.15}{118.369 + 18.15} = 13.30 \text{ PERCENT}$$

MOLE FRACTION OF DRY STACK GAS

FWD = (100. - BWO) / 100.

$$FWD = \frac{100. - 13.3}{100.} = .867$$

AVERAGE MOLECULAR WEIGHT OF DRY STACK GAS

MD = (PCO2 * .44) + (PO2 * .32) + (PN2 + PCO) * .28

MD = (12.60*44/100) + (6.1*32/100) + ((81.4+ .0) * 28/100 = 30.26

MOLECULAR WEIGHT OF STACK GAS

MWS = MD * (1. - (BWO/100)) + 18. * (BWO/100)

MWS = 30.26* (1. -(13.30/100)) + 18. * (13.30/100) = 28.63

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STACK GAS VELOCITY AT STACK CONDITIONS

DELP = SUM. OF THE SQRT(VH * (TS + 460.))

VS = 85.49 * CP * DELP / (SQRT(BWS * PS) * PATS)

VS = 85.49 * .84 * 418.066 / (SQRT(28.63 * 29.19) * 12. = 86.55 FPS

STACK GAS VOLUMETRIC FLOW AT STACK CONDITIONS

QS = VS * AS * 3600/144

QS = 86.55 * 45239. 3600/144 = 97881872. ACFM

STACK GAS VOLUMETRIC FLOW AT STANDARD CONDITIONS

QSSTD = 17.647 * QS * PS * (1. - (BWO/100)) / (TS + 460.)

$$QSSTD = \frac{17.647 * 97881872. * 29.19 * (1. - (13.30/100))}{(168. + 460.)} = 64600912. \text{ SCFM}$$

PERCENT ISOKINETIC

ISO = (305.58*(TS+460.))*((0.002669*VLC)+(VM*Y*(PB+(PM/13.6))/(TM+460.)))/(TT*VS*PS*DN*DN)

$$ISO = \frac{(305.58*(168.+460.))*((0.002669* 386.)+(125.297* .988*(29.30+(3.592/13.6))/(86.+460.)))}{120. * 86.55 * 29.19 * .221 * .221} = 100.29 \text{ PERCENT}$$

PARTICULATE LOADING -- EPA METHOD 5 (AT STANDARD CONDITIONS)

CS = 0.001 * MN * 15.43 / VMSTD

CS = 0.001 * 77.3 * 15.43 / 118.369 = .0101 GR/DSCF

PARTICULATE LBS/HR -- EPA METHOD 5

PMR = CS * QSSTD / (15.43 * 453.6)

PMR = .0101 * 64600912. / (15.43 * 453.6) = 100.203

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END OF PROGRAM
:EOJ
CPU SEC. = 99.  ELAPSED MIN. = 4.  WED, JAN  5, 1983,  5:27 PM
```

APPENDIX B

FIELD DATA

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER - PLEASANTS	11/29/82	UNIT 1	MSB

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
1AMSB	DC	50	25.94	-15	0002256	240	84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.185	1-08	12		FB4	1.87	1.037	60	.006			320	320		10

Pretest @ 15" OK

DR 124
Great Pump #214

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F
	0	1130	256.564										
	10.		262.80	1.5	1.37	1.37	145	50	50	5.0	301	327	46
	20.		268.94	1.5	1.38	1.38	145	55	50	5.0	336	324	43
	30.		275.12	1.5	1.38	1.38	147	58	51	5.0	335	313	43
	40.		281.13	1.4	1.29	1.29	147	60	53	4.7	342	319	51
	50.		287.41	1.5	1.39	1.39	147	63	54	4.8	333	327	72
	60.		293.47	1.4	1.30	1.30	146	64	55	4.7	319	334	69
	70.		299.68	1.5	1.39	1.39	146	65	56	4.9	334	334	68
	80.		305.89	1.5	1.39	1.39	148	66	56	4.9	326	323	72
	90.		312.22	1.6	1.49	1.49	146	67	57	5.1	324	313	62
	100.		318.37	1.5	1.40	1.40	148	67	57	5.0	320	316	61
	110.		324.60	1.5	1.40	1.40	146	67	57	5.1	325	313	61
	120.	1330	330.965	1.6	1.49	1.49	146	67	58	5.3	327	327	62

4970 A&B RUN. NO. 1A-MSB

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EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MELO POWER - PLEASANTS	11/23/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
1BM5B	DG	50	29.94	-1.5	0002755	246	.84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.186	1-11	12		FB	1.90	.998	5.0	.009			320	320		10

PUMP FB-6

Posttest LC @ 17" OK

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F
	0	1131	969.456										
	10.		975.74	1.5	1.37	1.37	145	47	46	2.0	337	318	47
	20.		981.84	1.5	1.37	1.37	145	50	46	2.9	343	318	44
	30.		987.93	1.5	1.38	1.38	147	54	47	3.4	336	311	44
	40.		993.96	1.4	1.29	1.29	147	57	48	3.8	365	316	50
	50.		0.30	1.5	1.39	1.39	147	59	49	4.2	354	319	63
	60.		6.42	1.4	1.30	1.30	146	61	50	4.2	350	317	68
	70.		12.75	1.5	1.39	1.39	146	62	51	4.3	341	316	69
	80.		19.12	1.5	1.39	1.39	148	62	52	4.4	340	313	71
	90.		25.66	1.6	1.49	1.49	146	63	52	4.7	339	313	66
	100.		31.95	1.5	1.40	1.40	148	63	53	4.7	339	313	66
	110.		38.30	1.5	1.40	1.40	146	64	54	4.7	340	310	63
	120.	1331	44.810	1.6	1.49	1.49	146	64	54	4.8	351	312	57

4972 A&B RUN. NO. 1B-M5B

* M5F 1aw

1-C

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
NORTH POWER ALLEGHENY	11/29/84	UNIT 1	M5BW

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
K-M5BW	CLARKE	60	28.94	T/S	0992759		0.84	291	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.188	1-1126	12	9	FB3	2.00	1.0016	10	.001	1.10		320	320		10

Pretest @15" OK

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F (Filter/Probe)	IMPINGER TEMPERATURE °F
	0	11:30	226.085									
	10.0	11:40	232.100	1.5	1.36	1.4	145	54	48	4.5	321/298	47
	20.0	11:50	239.007	1.5	1.35	1.4	145	53	48	4.0	280/323	40
	30.0	12:00	245.100	1.5	1.36	1.4	147	60	48	4.5	306/322	40
	40.0	12:10	250.435	1.4	1.3	1.3	147	62	48	4.5	323/318	52
	50.0	12:20	256.325	1.5	1.36	1.4	147	64	48	4.5	323/329	66
	60.0	12:30	262.400	1.4	1.3	1.3	146	65	49	4.5	327/320	68
	70.0	12:40	269.015	1.5	1.4	1.4	146	67	50	4.5	322/317	64
	80.0	12:50	275.743	1.5	1.4	1.4	148	68	52	4.5	328/317	60
	90.0	13:00	280.643	1.6	1.5	1.5	146	70	54	5.0	315/320	60
	100.	13:10	287.710	1.5	1.4	1.4	148	70	54	5.0	335/321	50
	110.	13:20	293.125	1.5	1.4	1.4	146	70	54	4.5	321/323	48
	120.	13:30	299.870	1.6	1.5	1.5	146	70	54	4.5	314/324	44

4973 A&B RUN. NO. K-M5BW

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER R. ENSAUTS	11/29/82	KUMIT 1	M5BW

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
1D M5BW	KYAAKE	50	28.94	-1.5	00092753		F83 0.84	20	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
10' GLASS	.195	1.994			FB5	1.95	.988	6P	.008	1.0		324	320		10

Pretest OK @ 15"

P

V_{uc}=147.0

DI #: 125

PITOT # 183

Leak Check + ✓ − ✓

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F (Filt/Probe)	IMPINGER TEMPERATURE °F
	0	11:30	915.918									
	10.0	11:40	921.900	1.5	1.30	1.4	145	54	54	5.0	348/321	33
	20.0	11:50	928.255	1.5	1.35	1.4	145	56	53	5.0	320/307	40
	30.0	12:00	934.600	1.5	1.37	1.4	147	62	54	5.5	341/326	40
	40.0	12:10	940.170	1.4	1.3	1.3	147	68	55	5.5	321/319	52
	50.0	12:20	947.225	1.5	1.4	1.4	147	72	57	6.0	339/316	64
	60.0	12:30	953.308	1.4	1.3	1.3	146	75	60	6.0	302/319	68
	70.	12:40	958.902	1.5	1.4	1.4	146	76	61	6.0	333/318	60
	80.	12:50	965.690	1.5	1.4	1.4	148	78	63	6.0	349/317	62
	90.	13:00	972.283	1.6	1.5	1.5	146	78	64	6.0	312/318	64
	100.	13:10	978.535	1.5	1.4	1.4	148	80	65	6.0	324/318	62
	110.	13:20	985.200	1.5	1.4	1.4	146	80	65	6.0	318/319	58
	120.	13:30	992.144	1.6	1.5	1.5	146	80	66	6.0	310/320	59

$\overline{\sqrt{\Delta P}}$ 1.225

$\overline{\Delta P}$ 1.5

B-5

4974 A&B RUN. NO. 1D-M5BW

Imp. Temp 10° Low

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QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant [illegible] POWER / PLEASANTS Sample date 11/29/82

Sample location OUTLET Recovery date 11/29/82

Run number 1A-M5B Recovered by PHILLIPS / ANTESBERGER

Particulate sample type YES M5B ~~M5-320~~ ~~M5-450~~ 150 PYRO M5B BIN

Particulate filter number # 0002756

Particulate filter sample I.D. 4970B

Probe rinse ACETONE I.D. 4970A

Purge train 20 min (check when completed) /

Location of filter in back half BETWEEN 2ND + 3RD IMP

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	557.5 g	639.4 g	639.1 g	654.7 g	915.3 g
Initial wt	485.8 g	660.4 g	592.7 g	616.0 g	824.8 g
Net wt	71.7 g	-21.0 g	46.4 g	38.7 g	90.5 g

Total moisture 226.3 g 85 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4970A

IPA IMP. CONTAINER I.D. 4983A LIQUID LEVEL MARKED /

H_2O_2 IMP. CONTAINER I.D. 4984A LIQUID LEVEL MARKED /

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	4982A	/
H_2O_2	4981A	/
H_2O	4975A	/
Acetone	4971A	/

Samples stored and locked

Remarks

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant MONONGAHELA POWER/PLEASANTS Sample date 11/29/82

Sample location #1 OUTLET Recovery date 11/29/82

Run number 1B-M5B Recovered by PHILLIPS/AUTESBERGER

Particulate sample type YES M5B ~~M5-330~~ ~~M5-450~~ M5B-Avg M5B3U

Particulate filter number # 0002755

Particulate filter sample I.D. 4972B

Probe rinse ACETONE I.D. 4972A

Purge train 20 min (check when completed) ✓

Location of filter in back half BETWEEN 2ND + 3RD IMP.

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	577.5 g	631.9 g	635.6 g	658.1 g	903.8 g
Initial wt	~~491.6~~ g	651.5 g	539.2 g	600.5 g	775.6 g
Net wt	85.9 g	-19.6 g	96.4 g	57.6 g	128.2 g

Total moisture 298.5 g 85 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4972A

IPA IMP. CONTAINER I.D. 4985A LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 4986A LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 4982A ✓

H_2O_2 4981A ✓

H_2O 4975A ✓

Acetone 4971A ✓

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by [signature] Date 12/3/82

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant MONONGAHELA POWER/PLEASANTS STA. Sample date 11/29/82

Sample location OUTLET Recovery date 11/29/82

Run number 1C-M5BW Recovered by PHILLIPS/ANTESBERGER

Particulate sample type ____ M5B ____ ~~M5-320~~ ____ ~~M5-450~~ M5B-P400 yes M5BW

Particulate filter number #0002754

Particulate filter sample I.D. 4973B

Probe rinse H_2O I.D. 4973A

Purge train 20 min (check when completed) ✓

Location of filter in back half BETWEEN 2ND + 3RD IMP.

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	586.6 g	620.4 g	632.1 g	637.1 g	849.3 g
Initial wt	492.6 g	671.4 g	576.8 g	580.8 g	801.5 g
Net wt	94.0 g	-51.0 g	55.3 g	56.3 g	47.8 g

Total moisture 202.4 g 90 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4973A

IPA IMP. CONTAINER I.D. 4987A LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 4988A LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	4982A	✓
H_2O_2	4981A	✓
H_2O	4975A	✓
Acetone	4971A N/A	✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant MONONGAHELA POWER/PLEASANTS STA. Sample date 11/29/88
Sample location #1 OUTLET Recovery date 11/29/88
Run number 1D-M5BW Recovered by PHILLIPS/ANTESBERGER
Particulate sample type ____ M5B ____ ~~M5-320~~ ____ ~~M5-450~~ M5B-P400 ✓ M5BW
Particulate filter number # CC02753 ✓
Particulate filter sample I.D. 4974B ✓
Probe rinse H2O I.D. 4974A ✓
Purge train 20 min (check when completed) ✓
Location of filter in back half BETWEEN 2ND + 3RD IMP

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	586.0 g	638.5 g	619.4 g	622.8 g	873.1 g
Initial wt	487.2 g	668.5 g	596.9 g	606.2 g	834.0 g
Net wt	98.8 g	-30.0 g	22.5 g	16.6 g	39.1 g

Total moisture 147.0 g 70 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4974A ✓
IPA IMP. CONTAINER I.D. 4989A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 4990A ✓ LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 4982A ✓ ✓
H_2O_2 4981A ✓ ✓
H_2O 4975A ✓ ✓
Acetone 4971A ✓ ✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date 12/1/88
Remarks [illegible]

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Mono Power
DATE 11/24/82 TEST NO 1
SAMPLING TIME (24-hr CLOCK) _____
SAMPLING LOCATION Stack
SAMPLE TYPE (BAG) INTEGRATED, CONTINUOUS) _____
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 50
OPERATOR Phillips
ORSAT LEAK CHECKED /

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	12.0	12.0	12.1	12.1	12.1	12.1	12.1	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.9	6.9	19.0	6.9	19.0	6.9	6.9	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER - PLEASANTS	11/29/82	UNIT 1	MSB-P400

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
2AMSAH	DIO	50	28.92	-1.5	000266F2	2×10	.79		10 F 1

DR 124
OP 214

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.174	1-06	10		FB8	1.87	1.032					400	320		10

Post LC @ 15" → OK; bad post test @ 4" - broken back half filter holder

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	F	IMPINGER TEMPERATURE °F
	0	1525	331.169										
	10.		337.27	1.5	1.25	1.25	151	53	53	3.4	392	316	40
	20.		342.60	1.2	1.00	1.00	153	54	52	2.2	380	340	40
	30.		348.11	1.3	1.08	1.08	156	58	52	2.4	373	344	38
	40.		353.38	1.2	1.00	1.00	157	61	53	2.2	383	341	40
	50.		358.74	1.2	1.01	1.01	155	63	54	2.2	388	336	42
	60.		364.12	1.2	1.01	1.01	153	65	55	2.2	392	333	44
	70.		369.45	1.2	1.02	1.02	153	66	56	2.2	390	330	45
	80.		375.12	1.3	1.10	1.10	155	66	57	2.3	391	327	47
	90.		381.33	1.6	1.35	1.35	155	67	58	2.8	392	329	49
	100.		387.93	1.9	1.61	1.61	155	68	58	3.1	396	337	50
	110.		395.30	2.0	1.70	1.70	152	69	59	3.3	397	340	54
	120.	1725	402.061	2.0	1.72	1.72	148	69	59	3.3	396	345	53

199; A&B RUN. NO. 2AMSB-P400

B-11

Reproduced from best available copy.

ΔH avg = 1.20 T_m = 59   ~5F low

EMISSION TESTING FIELD DATA.

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER - PLEASANTS	11/23/84	UNIT 1	MSR-PKCO

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (In. Hg)	STATIC PRESS (In. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
ZBMSBR	DO	50	28.92	-.15	0002683	2X8	.84		1 OF 1

DR 124
OP 214

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER Δ H @	METER CAL. FACTOR Y	LEAK CHECK In. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.177	1-92	10		FB8170	.994	15	.012				400	320		10

Pump 186

Pretest LC @ 15" → .024
" " @ 10" → OK

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F
	0	1526	46.401										
	10.		52.29	1.5	1.25	1.25	151	51	50	3.0	351	316	45
	20.		57.61	1.2	1.00	1.00	153	53	50	3.0	345	342	43
	30.		63.12	1.3	1.08	1.08	156	57	50	4.3	345	347	44
	40.		68.50	1.2	1.00	1.00	157	60	51	4.0	343	347	47
	50.		73.83	1.2	1.01	1.01	155	62	52	3.8	345	345	52
	60.		79.24	1.2	1.01	1.01	153	63	53	3.9	345	338	59
	70.		84.70	1.2	1.02	1.02	153	64	55	3.7	344	334	59
	80.		90.53	1.3	1.10	1.10	155	65	55	3.6	343	331	60
	90.		96.92	1.6	1.35	1.35	155	65	56	3.7	346	332	62
	100.		103.75	1.9	1.61	1.61	155	66	57	3.9	350	333	62
	110.		111.46	2.0	1.70	1.70	157	67	58	4.0	347	332	63
	120.	1726	118.325	2.0	1.72	1.72	148	67	58	4.0	348	332	63

1994 A&B RUN. NO. ZB,MSB-Part

2 C

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONGA POWER PLEASANTS	11/29/92	UNIT 1	M5B

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
2C-M5B	CLARKE	58	28.96	-1.5	0100268A	246	0.84	2P	0 F

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	0.189	V-9	11		FB3	2.00	1.0061	10.0	0.015	~~[illegible]~~ 1.01		320	320		10

post#5" ok

DIGITAL - 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	15:25	300.184								AIR 0280	
	10.0	15:35	306.061	1.5	1.27	1.3	151	50	52	3.0	298/298	42
	20.0	15:45	312.007	1.2	1.19	1.2	153	54	52	3.0	329/380	40
	30.	15:55	317.525	1.3	1.12	1.1	156	60	54	3.0	313/348	42
	40.	16:05	323.417	1.2	1.0	1.0	157	64	54	3.0	331/332	40
	50.	16:15	328.120	1.2	1.0	1.0	155	68	54	3.0	319/327	42
	60.	16:25	333.675	1.2	1.0	1.0	153	68	54	3.0	320/321	40
	70.	16:35	339.127	1.2	1.0	1.0	153	70	54	3.0	328/325	42
	80.	16:45	345.355	1.3	1.1	1.1	155	72	54	3.0	330/325	40
	90.	16:55	351.110	1.6	1.4	1.4	155	73	56	3.5	322/326	40
	100.	17:05	357.753	1.9	1.6	1.6	155	75	58	4.0	320/323	42
	110.	17:15	363.636	2.0	1.7	1.7	152	75	58	4.0	328/322	40
	120.	17:25	371.025	2.0	1.7	1.7	148	76	60	4.0	321/321	42

1997 A&B RUN. NO. 2CM5B

$\overline{\sqrt{\Delta p}}$ 1.2 $\overline{T_m}$ 61 Imp. Temp 14° low

2-D

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONKIG POWER PLANTS	1/29/84	KUIIT	MSB

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
2D 7MSB	RIVARD	57	4896	-1.5	1000126185	249	.84	R9	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.184	-04	10		FB5	1.85	.988	6	.0015	~~1.00~~ pretotal @15 1.01		329	329		10

DIGITAL-125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F FLTR/PRBE	IMPINGER TEMPERATURE °F
	0	15:25	992.365									
	10.	15:35	999.190	1.5	1.3	1.3	151	60	60	4.5	319/305	40
	20.	15:45	003.925	1.2	1.0	1.0	153	60	60	4.0	338/330	40
	30.	15:55	009.388	1.3	1.1	1.1	156	60	60	4.0	325/327	42
	40.	16:05	014.224	1.2	1.03	1.0	157	70	60	4.0	318/327	44
	50.	16:15	020.065	1.2	1.0	1.0	155	72	60	4.0	328/327	48
	60.	16:25	026.450	1.2	1.0	1.0	153	74	62	4.0	331/329	48
	70.	16:35	031.300	1.2	1.0	1.0	153	76	64	4.5	331/325	52
	80.	16:45	037.310	1.3	1.1	1.1	155	77	65	5.0	319/325	54
	90.	16:55	044.000	1.6	1.4	1.4	155	78	66	5.0	317/321	50
	100.	17:05	050.250	1.9	1.65	1.6	155	79	66	5.0	325/331	50
	110.	17:15	057.201	2.0	1.76	1.8	152	80	67	5.0	329/339	52
	120.	17:25	064.545	2.0	1.78	1.8	148	81	68	6.0	326/327	48

5000 A&B RUN. NO. ZDMSB

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power / Pleasants Station Sample date 11/29/82

Sample location #1 Outlet Recovery date 11/30/82

Run number 2A-M5B-P400 Recovered by MP/RA

Particulate sample type ______ M5B ______ ~~M5-320~~ yes ~~M5-450~~ M5B-P400 ______ M5W

Particulate filter number 0002682

Particulate filter sample I.D. 4991 B

Probe rinse Acetone I.D. 4971 A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd + 3rd Impinger

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	580.8 g	634.9 g	631.8 g	630.7 g	705.9 g
Initial wt	[redacted]498.8 g	674.5 g	590.4 g	600.6 g	854.3 g
Net wt	82.0 g	-39.6 g	41.4 g	30.3 g	51.6 g

Total moisture 165.7 g 60 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D.	4971 A		✓
IPA IMP. CONTAINER I.D.	4992 A ✓	LIQUID LEVEL MARKED	✓
H_2O_2 IMP. CONTAINER I.D.	4993 A ✓	LIQUID LEVEL MARKED	✓
BLANK CONTAINER(S) I.D.		LIQUID LEVEL MARKED	
IPA	4982 A		✓
H_2O_2	4981 A		✓
H_2O	4975 A		✓
Acetone	4971 A ✓		✓

Samples stored and locked ______

Remarks ______

LABORATORY CUSTODY

Received by [signature] Date 12/3/82

Remarks Rec. #03920

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant MONO POWER/PLEASANTS STATION Sample date 11/29/82

Sample location #1 OUTLET Recovery date 11/30/82

Run number 2B-M5B-P400 Recovered by MP/RA

Particulate sample type ____ M5B ____ M5-320 ____ yes M5-430 M5B-P400 ____ M5W

Particulate filter number 0002683

Particulate filter sample I.D. 4994B

Probe rinse Acetone I.D. 4994A

Purge train 20 min (check when completed) /

Location of filter in back half Between 2nd + 3rd Impinger

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	612.0 g	614.5 g	650.7 g	644.2 g	916.5 g
Initial wt	525.6 g	645.5 g	601.1 g	602.9 g	854.7 g
Net wt	86.4 g	-31.0 g	49.6 g	41.3 g	61.8 g

Total moisture 208.1 g 75 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4994A

IPA IMP. CONTAINER I.D. 4995A LIQUID LEVEL MARKED /

H_2O_2 IMP. CONTAINER I.D. 4996A LIQUID LEVEL MARKED /

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	4982A	/
H_2O_2	4981A	/
H_2O	4975A	/
Acetone	4971A	/

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible] # 03920

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant MONO POWER/PLEASANTS STA Sample date 11/29/82

Sample location #1 OUTLET Recovery date 11/30/82

Run number 2C-M5B Recovered by MCP/RA

Particulate sample type ~~M5~~ M5B ~~M5-330~~ ~~M5-450~~ M5B-2400 M5W

Particulate filter number 0002684

Particulate filter sample I.D. 4997B

Probe rinse Acetone I.D. 4997A

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd + 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	629.9 g	658.2 g	608.0 g	613.8 g	863.4 g
Initial wt	496.7 g	677.7 g	565.3 g	592.5 g	834.0 g
Net wt	133.2 g	-19.5 g	42.7 g	21.3 g	29.4 g

Total moisture 207.1 g 40 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4997A

IPA IMP. CONTAINER I.D. 4998A LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 4999A LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 4982A ✓

H_2O_2 4981A ✓

H_2O 4975A ✓

Acetone 4971A ✓

Samples stored and locked ✓

Remarks

LABORATORY CUSTODY

Received by [signature] Date 12/3/82

Remarks Log # 039020

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power/Pleasant Sta. Sample date 11/29/82

Sample location #1 Outlet Recovery date 11/29/82

Run number 2D-M5B Recovered by MCP/RA

Particulate sample type yes M5B ~~M5-320~~ ~~M5-450~~ M5B-P400 M5W

Particulate filter number 0002685

Particulate filter sample I.D. 5000B

Probe rinse Acetone I.D. 5000A

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	592.2 g	631.3 g	646.7 g	627.5 g	904.1 g
Initial wt	498.9 g	672.5 g	592.0 g	588.2 g	843.3 g
Net wt	93.3 g	-41.2 g	54.7 g	39.3 g	60.8 g

Total moisture 206.9 g 65 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5000A

IPA IMP. CONTAINER I.D. 5101A LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 5102A LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 4982A ✓

H_2O_2 4981A ✓

H_2O 4975A ✓

Acetone 4971A ✓

Samples stored and locked

Remarks

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible]

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Mono Power
DATE 11/29/82 TEST NO 2
SAMPLING TIME (24-hr CLOCK) _____
SAMPLING LOCATION Stack
SAMPLE TYPE (BAG) INTEGRATED, CONTINUOUS) _____
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE _____
OPERATOR Phillips
ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	11.7	11.7	11.8	11.8			11.75	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.4	6.7	18.4	6.6			6.65	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MIDWA POWER - PLEASANTS	11/30/82	UNIT 1	MSBW

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
3AMSBW	DO	50	29.19	-15	9002687	240	84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O, (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	222	2-11	12		KB4	1.87	1.932	10	.006			320	320		10

PreVest LC @ 15" → OK

DR 124
TC 201
P 183
OP 214

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER* TEMPERATURE °F
	0	1018	413.534										
	10.		421.93	1.5	2.75	2.75	152	51	51	6.3	345	319	43
	20.		430.91	1.7	3.11	3.11	157	55	51	8.3	323	316	42
	30.		439.99	1.7	3.12	3.12	157	59	51	8.3	317	329	51
	40.		449.05	1.7	3.15	3.15	158	62	54	8.1	319	334	46**
	50.		457.88	1.6	2.97	2.97	157	66	56	7.7	319	325	88
	60.		466.95	1.7	3.16	3.16	159	68	57	8.2	324	318	83
	70.		476.09	1.7	3.16	3.16	159	69	58	8.1	322	326	62
	80.		485.46	1.8	3.36	3.36	159	70	59	8.3	321	334	56
	90.		494.63	1.7	3.20	3.20	155	71	60	7.8	317	321	51
	100.		504.09	1.8	3.37	3.37	158	70	60	8.2	324	319	48
	110.		513.76	1.9	3.55	3.55	159	71	61	8.6	322	329	47
	120.	1218	523.638	2.0	3.76	3.76	156	70	62	9.1	323	334	45

B-20

Reproduced from best available copy.

5103 A&B RUN. NO. 3AMSBW

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER PLEASANTS	11/30/82	UNIT 1	M5BW

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H₂O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
3BM5BW	D.O	50	29.19	-1.5	0002686	240	.84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.226	2-10	12		FBN	1.99	.995	12	.014			320	320		10

Pretest LC @ 4" → OK

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	F	IMPINGER TEMPERATURE °F
	0	1019	129.352										
	10.		137.93	1.5	2.75	2.75	152	48	47	7.4	326	317	44
	20.		147.04	1.7	3.11	3.11	157	52	47	9.7	331	318	42
	30.		156.26	1.7	3.12	3.12	157	55	48	10.2	328	327	51
	40.		165.57	1.7	3.15	3.15	158	59	49	10.2	328	326	109**
	50.		174.61	1.6	2.97	2.97	157	61	51	9.9	329	327	108
	60.		183.98	1.7	3.16	3.16	159	63	52	10.2	331	329	78
	70.		193.21	1.7	3.16	3.16	159	64	53	10.0	330	337	62
	80.		202.75	1.8	3.36	3.36	159	65	54	10.4	329	338	73
	90.		212.14	1.7	3.20	3.20	155	65	55	10.2	327	331	52
	100.		221.80	1.8	3.37	3.37	158	65	56	10.7	332	327	47
	110.		231.64	1.9	3.55	3.55	159	65	57	11.2	331	327	46
	120.	1219	241.529	2.0	3.76	3.62	156	65	57	11.5	332	325	46

DR 124
TC 201
P 183
OP 214
Pump FBL

5108 A&B RUN. NO. 3B-M5BW

3.21 54 * ~5F low ** too close to [illegible]

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONGO POWER PLEASANTS	11/30/82	UNIT 1	MSB

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
3C-MSB	CLARKE	50	29.19	-1.5	0002629	249	84	201	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	K FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
ST. GLASS	220	2-09	12	GDF	KGS	2.90	1.906	65	OPP		214	349	349		10

Pretest @ 180K

Pitot 183
DIGITAL 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F FLTR / PRBE	IMPINGER TEMPERATURE °F
	0	10:20	383.047									
	10.0	10:30	392.174	1.5	2.68	2.7	158	50	50	4.0	319/310	34
	20.0	10:40	400.000	1.7	3.01	3.0	157	54	48	4.0	321/310	36
	30.0	10:50	409.625	1.7	3.0	3.0	157	60	48	5.0	328/320	44
	40.0	11:00	418.455	1.7	3.05	3.05	158	68	49	5.0	329/318	78
	50.0	11:10	428.620	1.6	2.9	2.9	157	71	50	5.0	348/317	68
	60.0	11:20	436.245	1.7	3.07	3.1	159	74	51	5.5	320/319	64
	70.0	11:30	445.910	1.7	3.07	3.1	159	76	54	6.0	327/318	54
	80.0	11:40	454.735	1.8	3.28	3.3	159	78	55	6.0	329/317	49
	90.0	11:50	464.275	1.7	3.12	3.1	155	80	56	6.0	328/314	46
	100.0	12:00	473.728	1.8	3.3	3.3	158	80	58	6.0	305/319	44
	110.0	12:10	483.055	1.9	3.48	3.5	159	82	59	6.0	323/320	40
	120.0	12:20	493.098	2.0	3.7	3.7	156	82	64	6.5	313/320	40

5109 A&B RUN. NO. 3C-MSB

B-22

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MIDLAND PIONEER ALLIS AMITS	11/30/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
3DM5B	CLARKE		BP 29.10	-1.5	1000 2688	249		81 20	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	K FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.220	2-1-2	12		FBS	1.85	.988	25	.006		2.14	320	320		10

PRETEST @ 20 OK

Ref 183
DIGITAL 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	10:20	076.490									
	10.0	10:30	086.623	1.5	2.69	2.7	158	52	52	7.0	324/311	40
	20.0	10:40	093.500	1.7	3.04	3.0	157	58	54	8.0	326/274	38
	30.0	10:50	098.275	1.7	3.0	3.0	157	56	55	8.5	321/296	46
	40.0	11:00	113.492	1.7	3.1	3.1	158	76	58	8.5	320/322	88
	50.0	11:10	124.300	1.6	2.94	2.9	157	78	60	8.0	319/321	74
	60.0	11:20	133.217	1.7	3.12	3.1	159	80	62	8.0	321/324	64
	70.0	11:30	142.245	1.7	3.13	3.1	159	81	64	8.0	329/323	58
	80.0	11:40	151.520	1.8	3.33	3.3	159	83	66	8.0	331/323	51
	90.0	11:50	161.725	1.7	3.17	3.2	155	84	67	8.0	328/318	44
	100.0	12:00	171.830	1.8	3.39	3.3	158	84	68	8.0	321/323	40
	110.0	12:10	181.400	1.9	3.53	3.5	159	85	69	8.0	319/324	40
	120.0	12:20	191.429	2.0	3.73	3.7	156	85	70	8.5	329/323	36

B-23

5111 A&B RUN. NO. 3DM5B

$\sqrt{\Delta p}$ 1.32 157.2 68.6

Imp Therm 11° low

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mon Power Sample date 11/30/82

Sample location Stack Recovery date 11/30/82

Run number 3AM5BW Recovered by MCP/RA

Particulate sample type ____ M5 ____ M5-320 ____ M5-450 ✓ M5~~W~~BW

Particulate filter number # 000 2687 ✓

Particulate filter sample I.D. 5103B ✓

Probe rinse Water I.D. 5103A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	602.6 g	684.3 g	669.6 g	629.7 g	892.2 g
Initial wt	491.9 g	671.6 g	618.2 g	591.7 g	808.3 g
Net wt	110.7 g	12.7 g	51.4 g	38 g	83.9 g

Total moisture 296.7 g ~80 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5103A ✓

IPA IMP. CONTAINER I.D. 5104A ✓ LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 5105A ✓ LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5123A ✓ ✓

H_2O_2 5124A ✓ ✓

H_2O 5125A ✓ ✓

Acetone 5126A ✓ ✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mon Power Sample date 11/30/82

Sample location Stack Recovery date 11/30/82

Run number 3BM5BW Recovered by MCP/RA

Particulate sample type ____ M5 ____ M5-320 ____ M5-450 ✓ M5~~#~~BW

Particulate filter number #0002686 ✓

Particulate filter sample I.D. 5106B ✓

Probe rinse Water I.D. 5106A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	497.7 ~~[illegible]~~ g	593.9 ~~764.8~~ g	697.2 ~~593.9~~ g	764.8 g	950.4 g
Initial wt	490.0 g	666.8 g	601.4 g	609.2 g	859.4 g
Net wt	7.7 g	-72.9 g	95.8 g	155.6 g	91 g

Total moisture 277.2 g 75 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5106A ✓

IPA IMP. CONTAINER I.D. 5107A ✓ LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 5108A ✓ LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5123A ✓ ✓

H_2O_2 5124A ✓ ✓

H_2O 5125A ✓ ✓

Acetone 5126A ✓ ✓

Samples stored and locked ____

Remarks 1st and 2nd Impingers were switched in the sampling train

LABORATORY CUSTODY

Received by [illegible] Date 12/3/82

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mon Power — Sample date 11/30/82
Sample location Stack — Recovery date 11/30/82
Run number 3CM5B — Recovered by MCP/RA
Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W
Particulate filter number #0220 2039 ✓
Particulate filter sample I.D. 5109B ✓
Probe rinse Acetone I.D. 5109A ✓
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	643.1 g	651.3 g	652.8 g	641.2 g	909.7 g
Initial wt	495.4 g	657.0 g	598.1 g	599.0 g	823.8 g
Net wt	147.7 g	-5.7 g	54.7 g	42.2 g	86.1 g

Total moisture 325 g — 90 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5107A ✓ ✓
IPA IMP. CONTAINER I.D. 5110A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 5111A ✓ LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED
IPA 5123A ✓ ✓
H_2O_2 5124A ✓ ✓
H_2O 5125A ✓ ✓
Acetone 5126A ✓ ✓

Samples stored and locked ✓
Remarks

LABORATORY CUSTODY

Received by [illegible] Date 12/1/82
Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mon Power — Sample date 11/30/82
Sample location Stack — Recovery date 11/30/82
Run number 3CM5B — Recovered by MCP/RA
Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W
Particulate filter number #0000 2039 ✓
Particulate filter sample I.D. 5109B ✓
Probe rinse Acetone — I.D. 5109A ✓
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	643.1 g	651.3 g	652.8 g	641.2 g	909.7 g
Initial wt	495.4 g	657.0 g	598.1 g	599.0 g	823.8 g
Net wt	147.7 g	-5.7 g	54.7 g	42.2 g	86.1 g

Total moisture 325 g — 90 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5107A ✓ — ✓
IPA IMP. CONTAINER I.D. 5110A ✓ — LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 5111A ✓ — LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. — LIQUID LEVEL MARKED
IPA 5123A ✓ — ✓
H_2O_2 5124A ✓ — ✓
H_2O 5125A ✓ — ✓
Acetone 5126A ✓ — ✓

Samples stored and locked ✓
Remarks

LABORATORY CUSTODY

Received by [illegible] — Date 12/1/82
Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mon Power Sample date 11/30/82
Sample location Stack Recovery date 11/30/82
Run number 3DM5B Recovered by MCP/RA
Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W
Particulate filter number #002688
Particulate filter sample I.D. 5112B.
Probe rinse Acetone I.D. 5112A
Purge train 20 min (check when completed) ✓
Location of filter in back half Between the 2nd + 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	636.3 g	675.9 g	633.2 g	613.5 g	987.7 g
Initial wt	496.5 g	675.2 g	586.4 g	576.0 g	890.3 g
Net wt	139.8 g	0.7 g	46.8 g	37.5 g	97.4 g

Total moisture 322 g 85 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5112A
IPA IMP. CONTAINER I.D. 5113A ✓ LIQUID LEVEL MARKED ____
H_2O_2 IMP. CONTAINER I.D. 5114A ✓ LIQUID LEVEL MARKED ____
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5123A ✓ ✓
H_2O_2 5124A ✓
H_2O 5125A ✓
Acetone 5126A ✓ ✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [signature] Date 12/3/82
Remarks ECC # 03420

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Mono Power

DATE 11/30/82 TEST NO 3

SAMPLING TIME (24-hr CLOCK) 1200

SAMPLING LOCATION Stack

SAMPLE TYPE (BAG) INTEGRATED, CONTINUOUS)

ANALYTICAL METHOD Orsat

AMBIENT TEMPERATURE 62

OPERATOR Phillips

ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	12.6	12.6	12.6	12.6				44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.8	6.2	18.7	6.1				32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER-PLEASANTS	11/30/84	UNIT 1	M5B

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
4AM5B	DO	55	29.15	-1.5	0002479	240	.84		1 OF 1

P
TC 201
DR 124
OP [illegible]

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.219	2-93	12		RB4	1.81	1.037	9.0	.002			320	320		10

Pretest LC @15" → OK

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F
	0	1328	523.858										
	10.		533.52	2.0	3.57	3.57	159	59	57	7.1	349	313	53
	20.		543.32	2.1	3.75	3.75	159	61	58	8.5	316	336	52
	30.		553.00	2.0	3.59	3.59	158	72	59	8.6	325	330	96
	40.		562.81	2.0	3.58	3.58	165	72	62	8.8	327	343	125
	50.		572.81	2.1	3.77	3.77	165	73	64	8.6	328	329	99
	60.		582.88	2.2	3.95	3.95	166	72	63	8.8	327	343	76
	70.		592.93	2.2	3.94	3.94	169	73	63	8.4	325	328	63
	80.		603.00	2.2	3.96	3.96	166	74	63	8.3	326	342	57
	90.		612.88	2.1	3.78	3.78	166	74	64	7.9	321	328	52
	100.		622.80	2.1	3.78	3.78	168	75	65	7.9	322	335	48
	110.		632.94	2.2	3.95	3.95	169	75	65	8.2	321	325	47
	120.	1528	642.746	2.1	3.78	3.78	168	76	66	7.8	316	331	45

5116 A&B RUN. NO. 4AM5B

Reproduced from best available copy.

√ΔP avg = 1.45 | 3.78 | 165 | 67 | ~5F low

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
M&O POWER PLEASANTS	11/30/82	UNIT 1	MSB

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE C_p	THERM NO.	PAGE
46MSB	DO	56	29.15	-1.5	10002692	240	.84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.249	2-07	12		1881	1.70	.998	7.0	.010			320	320		10

P
TC 201
DR 124
OP ~~2~~
Pump-FB6

Probe LC @12" → OK

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F
	0	1329	242.256										
	10.		252.14	2.0	3.57	3.57	157	57	55	5.7	301	342	43
	20.		262.23	2.1	3.75	3.75	159	60	55	6.7	314	332	52
	30.		272.10	2.0	3.59	3.59	158	65	56	6.8	316	331	72
	40.		281.91	2.0	3.58	3.58	165	69	59	6.7	316	327	124
	50.		291.97	2.1	3.77	3.77	165	71	60	6.8	316	328	102
	60.		302.19	2.2	3.95	3.95	166	72	61	6.9	319	340	72
	70.		312.50	2.2	3.94	3.94	169	72	61	6.8	320	342	61
	80.		322.75	2.2	3.96	3.96	166	73	62	6.8	322	342	54
	90.		333.08	2.1	3.78	3.78	166	73	63	6.5	317	338	49
	100.		343.29	2.1	3.78	3.78	168	74	64	6.5	316	332	48
	110.		353.68	2.2	3.95	3.95	169	74	64	6.7	316	328	47
	120.	1529	363.919	2.1	3.78	3.78	168	74	65	6.6	312	334	47

5119 A&B RUN. NO. 46MSB

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MANGO AGHAR ALIAGANTS	11/30/82	UNIT 1	MSB P100

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
4CM5BP	CLARKE	56	29.19	-.15	0002691	204	.84	2.01	10 F 7

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	K FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.219	2-02	12		FB3	2.00	1.006	15	.008		2 1/4	400	340		10

pretest @ 15 ok

Pitot DIGITAL - 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F (FLTR/PRBE)	IMPINGER TEMPERATURE °F
	0	13:30	493.363									
	10.0	13:40	503.136	2.0	3.75	3.8	159	62	62	7.5	325/490	40
	20.0	13:50	513.200	2.1	3.8	3.8	159	65	61	7.0	330/399	38
	30.0	14:00	523.684	2.0	3.66	3.7	158	75	61	7.0	336/383	40
	40.0	14:10	533.136	2.0	3.6	3.6	165	78	62	7.0	318/413	44
	50.0	14:20	543.765	2.1	3.82	3.8	165	80	62	7.0	325/411	46
	60.0	14:30	553.725	2.2	4.0	4.0	166	82	63	7.5	313/407	44
	70.0	14:40	563.895	2.2	4.0	4.0	169	84	64	7.5	319/401	48
	80.0	14:50	574.280	2.2	4.0	4.0	166	85	64	7.5	326/413	48
	90.0	15:00	584.813	2.1	3.84	3.8	166	85	65	7.0	314/409	52
	100.0	15:10	594.436	2.1	3.88	3.9	168	86	69	7.0	316/409	50
	110.0	15:20	604.55	2.2	4.0	4.0	169	86	69	7.5	324/409	56
	120.0	15:30	615.114	2.1	3.85	3.9	168	88	70	7.5	321/406	50

5127 A&B RUN. NO. 4CM5B-P400

tt

165 73 Imp Therm 14° low

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONGA POWER PLEASANTS	11/30/82	UNIT 1	M5B-PMOD

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
4DM5BA	CLARKE	56	29.19	-1.5	1900216A3	24P	.84	2.9	10 F 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK In. Hg	LEAK CHECK CFM	K FACTOR	K FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.221	21-107	12		FB5	1.95	.998	9.0	.000		214	450	314		10

Pretested @ 20" OK

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F PCTR/PRBE	IMPINGER TEMPERATURE °F
	0	13:30	192.382									
	10.0	13:40	201.736	2.0	3.61	3.6	157	66	66	4.5	335/424	40
	20.0	13:50	211.900	2.1	3.8	3.8	159	68	67	7.0	335/355	36
	30.0	14:00	223.915	2.0	3.65	3.7	158	67	67	7.5	339/416	40
	40.0	14:10	233.037	2.0	3.66	3.7	165	82	67	7.5	329/408	44
	50.0	14:20	244.271	2.1	3.86	3.9	165	85	68	7.5	316/402	48
	60.0	14:30	254.835	2.2	4.05	4.1	166	87	69	8.0	318/399	50
	70.0	14:40	265.900	2.2	4.03	4.0	169	87	70	8.0	335/405	49
	80.0	14:50	276.375	2.2	4.06	4.1	166	88	72	8.0	329/408	54
	90.0	15:00	287.720	2.1	3.88	3.9	166	88	72	8.0	319/399	58
	100.0	15:10	298.325	2.1	3.88	3.9	168	90	74	8.0	326/403	52
	110.0	15:20	309.110	2.2	4.06	4.1	169	90	74	8.0	319/403	50
	120.0	15:30	319.629	2.1	3.88	3.9	168	90	75	8.0	326/397	50

B-32

5130 A&B RUN NO. 4DM5B-PY00

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power — Sample date 11/30/82
Sample location Stack — Recovery date 11/30/82
Run number 4AM5B — Recovered by McP IRA
Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W
Particulate filter number #0002090 ✓
Particulate filter sample I.D. 5116B ✓
Probe rinse Acetone I.D. 5116A ✓
Purge train ~~20~~ 15 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	602.5 g	699.2 g	654.7 g	644.8 g	965.1 g
Initial wt	505.5 g	682.5 g	600.9 g	611.5 g	870.2 g
Net wt	97.0 g	16.7 g	53.8 g	33.3 g	94.9 g

Total moisture 295.7 g — 80 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5116A ✓ — /
IPA IMP. CONTAINER I.D. 5117A ✓ — LIQUID LEVEL MARKED /
H_2O_2 IMP. CONTAINER I.D. 5118A ✓ — LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. — LIQUID LEVEL MARKED

IPA	5123A ✓	✓
H_2O_2	5124A ✓	✓
H_2O	5125A ✓	✓
Acetone	5126A ✓	✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]
Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 11/30/82
Sample location Stack Recovery date 11/30/82
Run number 4B M5B Recovered by MCP/RA
Particulate sample type / M5B ____ M5-320 ____ M5-450 ____ M5W
Particulate filter number 2693
Particulate filter sample I.D. 5119B
Probe rinse Acetone I.D. 5119A
Purge train 20 min (check when completed) /
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	633.6 g	676.3 g	667.6 g	630.5 g	999.4 g
Initial wt	531.4 g	660.6 g	616.4 g	597.7 g	903.3 g
Net wt	102.2 g	15.7 g	50.7 g	32.8 g	96.1 g

Total moisture 297.5 g 95 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5119A
IPA IMP. CONTAINER I.D. 5120A LIQUID LEVEL MARKED /
H_2O_2 IMP. CONTAINER I.D. 5121A LIQUID LEVEL MARKED /
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5123A /
H_2O_2 5124A /
H_2O 5125A /
Acetone 5126A /

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]
Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 11/30/82
Sample location Stack Recovery date 11/30/82
Run number 4C M5B-P400 Recovered by MCP/RA
Particulate sample type ____ M5 ____ M5-320 ✓ ~~M5-450~~ M5B-P400 ____ M5W
Particulate filter number #0002691 ✓
Particulate filter sample I.D. 5127B ✓
Probe rinse Acetone I.D. 5127A ✓
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	718.5 g	655.6 g	641.0 g	619.7 g	952.2 g
Initial wt	501.2 g	673.6 g	590.7 g	580.7 g	871.2 g
Net wt	217.3 g	-18.0 g	56.3 g	39.0 g	81.0 g

Total moisture ~~376~~ 375.6 g 95 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5127A ✓
IPA IMP. CONTAINER I.D. 5128A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 5129A ✓ LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5123A ✓ ✓
H_2O_2 5124A ✓ ✓
H_2O 5125A ✓ ✓
Acetone 5126A ✓ ✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date 12/2/82
Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 11/30/82
Sample location Stack Recovery date 11/30/82
Run number 4DM5B-P400 Recovered by MCP/RA
Particulate sample type ____ M5 ____ M5-320 ✓ ~~M5-450~~ M5B-P400 ____ M5W
Particulate filter number # 0002693
Particulate filter sample I.D. 5130B
Probe rinse Acetone I.D. 5130A
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	710.1 g	662.7 g	658.1 g	622.0 g	929.7 g
Initial wt	504.8 g	677.8 g	595.3 g	587.4 g	849.6 g
		−15.1			
Net wt	205.3 g	~~84.9~~ g	62.8 g	34.6 g	80.1 g

Total moisture 367.7 g 95 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5130A ✓
IPA IMP. CONTAINER I.D. 5131A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 5132A ✓ LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5123A	✓
H_2O_2	5124A ✓	✓
H_2O	5125A	✓
Acetone	5126A	✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]
Remarks [illegible]

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Mono Power
DATE 11/30/82 TEST NO 4
SAMPLING TIME (24-hr CLOCK) 1500
SAMPLING LOCATION Stack
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE
OPERATOR Phillips
ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	13.0	13.0	12.8	12.8	12.8	12.8	12.9	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.6	5.6	18.7	5.9	18.7	5.9	5.8	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
KANO POWER PLEASANTS	11/30/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
SAM5B	DO	55	29.15	-1.5	000269A	240	.84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.222	Z-11	12		FB4	1.87	1.037	10	.008			320	320		10

P 183
TC 201
DR 124
OP

Pitot LC @15" → OK

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F
	0	1636	643.067										
	10.		652.82	2.0	3.67	3.67	168	62	62	8.7	324	322	52
	20.		662.32	1.9	3.48	3.48	170	64	62	9.2	315	335	48
	30.		672.13	1.9	3.51	3.51	169	74	63	9.0	322	321	106
	40.		681.67	1.9	3.51	3.51	169	70	64	8.1	317	319	102
	50.		691.24	1.9	3.51	3.51	169	72	63	8.2	321	334	76
	60.		700.85	1.9	3.53	3.53	168	74	64	8.2	321	338	61
	70.		710.53	1.9	3.53	3.53	169	75	65	7.9	320	322	54
	80.		720.24	1.9	3.54	3.54	167	76	65	7.8	323	325	50
	90.		730.07	2.0	3.73	3.73	169	76	66	8.2	331	336	48
	100.		739.75	1.9	3.54	3.54	169	76	67	7.8	330	337	47
	110.		749.43	1.9	3.55	3.55	167	76	67	7.7	334	321	48
	120.	1836	759.021	1.9	3.53	3.53	170	76	67	7.7	334	331	48

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5133 A&B RUN. NO. 5AM5B

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONA POWER - PLEASANTS	11/30/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
5BM5B	DG	55	29.65	-1.5	000295	240	.84		1 of 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.226	2-10	12		FB8	1.89	.998	9.0	.014			320	320		10

Pretest LC @19" → OK

P 183
TC 201
DR124
OP
Pump PB6

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F (P)	SAMPLE BOX TEMPERATURE °F (F)	IMPINGER TEMPERATURE °F
	0	1637	364.038										
	10.		373.99	2.0	3.67	3.67	168	61	60	8.6	306	328	53
	20.		383.81	1.9	3.48	3.48	170	62	60	8.8	318	335	48
	30.		393.75	1.9	3.51	3.51	169	65	59	9.0	323	335	56
	40.		403.66	1.9	3.51	3.51	169	69	61	8.7	324	337	102
	50.		413.58	1.9	3.51	3.51	169	70	61	8.7	324	334	82
	60.		423.60	1.9	3.53	3.53	168	71	62	8.7	324	336	81
	70.		433.56	1.9	3.53	3.53	169	71	62	8.5	324	330	73
	80.		443.60	1.9	3.54	3.54	167	72	63	8.4	328	330	61
	90.		453.71	2.0	3.73	3.73	169	72	63	8.8	334	328	57
	100.		463.66	1.9	3.54	3.54	169	72	64	8.6	334	328	56
	110.		473.58	1.9	3.55	3.55	167	73	64	8.5	335	324	54
	120.	1837	483.433	1.9	3.53	3.53	170	73	64	8.6	335	324	54

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5136 A&B RUN. NO. 5BM5B

66

*5K low

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ARNWGID POWER ACETSNITS	N/31/82	GWNIT 11	M5B

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
5C-M5B	CLARKE	55	29.19	-1.5	PP0256	210	.84	135	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.220	2-09	A2		FB3	2.90	1.006	8.0	.04		2.14	5.40	320		10

Note - Probe + Filter Center Cracked on Probe side

Pitot OK 1/4"   Post leak tight from back of train @ 10" test

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER INLET ($T_{m_{in}}$), °F	DRY GAS METER OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F FLTR/PRBE	IMPINGER TEMPERATURE °F
	0	16:36	615.322									
	10.0	16:46	624.170	2.0	3.58	3.6	168	66	66	8.5	324/336	50
	20.0	16:56	633.200	1.9	3.4	3.4	170	68	65	9.0	327/323	42
	30.0	17:06	644.550	1.9	3.9	3.4	169	74	64	9.5	329/327	85
	40.0	17:16	653.000	1.9	3.44	3.4	168	80	65	10.0	319/324	89
	50.0	17:26	663.626	1.9	3.45	3.5	169	82	65	9.0	313/323	60
	60.0	17:36	673.820	1.9	3.46	3.5	168	84	66	9.0	315/322	54
	70.0	17:46	683.520	1.9	3.46	3.5	169	85	66	9.0	316/321	50
	80.0	17:56	692.500	1.9	3.5	3.5	167	85	67	9.5	315/325	48
	90.0	18:06	702.723	2.0	3.65	3.7	169	86	67	10.0	316/330	48
	100.0	18:16	711.630	1.9	3.5	3.5	169	86	68	9.5	315/321	46
	110.0	18:26	721.235	1.9	3.5	3.5	167	86	68	9.5	315/321	44
	120.0	18:36	732.436	1.9	3.47	3.5	170	87	68	9.5	319/321	46

5139 A&B RUN. NO. 5CM5B

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONGO POWER PLANT	11/30/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
5DM5B	CLARKE	55	29.19	-1.5	1000269	240	.84	123	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	ℓ FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.249	2-1	2	120		FB 5	1.95	.988	13.5	.008		2.14	330	320		10

ok @ 20" PRETEST

DIGITAL 125
PITOT 1.25

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	16:38	320.033									
	10.0	16:48	329.500	2.0	3.6	3.6	168	70	70	8.0	323/304	50
	20.0	16:58	338.315	1.9	3.4	3.4	170	71	68	9.0	329/302	40
	30.0	17:08	351.273	1.9	3.45	3.5	169	79	68	9.0	344/327	74
	40.0	17:18	359.525	1.9	3.46	3.5	169	83	70	9.0	335/317	76
	50.0	17:28	369.998	1.9	3.48	3.5	169	86	70	9.0	313/326	58
	60.0	17:38	379.000	1.9	3.5	3.5	168	87	72	10.0	314/330	50
	70.0	17:48	388.915	1.9	3.5	3.5	169	88	72	10.5	317/328	50
	80.0	17:58	398.750	1.9	3.5	3.5	167	88	73	12.0	321/331	48
	90.0	18:08	408.880	2.0	3.7	3.7	169	88	74	13.0	324/319	46
	100.0	18:18	418.450	1.9	3.5	3.5	169	88	74	13.5	317/319	42
	110.0	18:28	428.700	1.9	3.5	3.5	167	87	74	13.0	314/320	47
	120.0	18:38	440.182	1.9	3.5	3.5	170	89	74	13.5	319/322	44

5142 A&B RUN. NO. 5DM5B

TBP 1.38 168.1 77.5 Imp Temp avoid 11° too

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mayo Power Sample date 11/30/82

Sample location Stack Recovery date 12/1/82

Run number 5AM5B Recovered by MCP/RA

Particulate sample type ✓ M5B _____ M5-320 _____ M5-450 _____ M5W

Particulate filter number 002694 ✓

Particulate filter sample I.D. 5133B ✓

Probe rinse Acetone I.D. 5133A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	632.0 g	677.4 g	640.5 g	644.7 g	939.6 g
Initial wt	491.1 g	673.0 g	593.9 g	606.7 g	853.5 g
Net wt	_____ g	_____ g	_____ g	_____ g	_____ g

Total moisture 316.0 g 85 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5133A ✓

IPA IMP. CONTAINER I.D. 5134A ✓ LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 5135A ✓ LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5057A ✓ ✓

H_2O_2 5058A ✓ ✓

H_2O 5059A ✓ ✓

Acetone 5060A ✓ ✓

Samples stored and locked _____

Remarks _____

LABORATORY CUSTODY

Received by [illegible] Date 12/3/82

Remarks W.O. # 23420

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 11/30/82

Sample location Stack Recovery date 11/30/82

Run number 5BM5B Recovered by MCP/RA

Particulate sample type ✓ M5B _____ M5-320 _____ M5-450 _____ M5W

Particulate filter number 000295 ✓

Particulate filter sample I.D. 5136B ✓

Probe rinse Acetone I.D. 5136A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	624.6 g	671.0 g	654.0 g	642.8 g	968.8 g
Initial wt	490.2 g	663.0 g	609.4 g	603.9 g	878.8 g
Net wt	_____ g	_____ g	_____ g	_____ g	_____ g

Total moisture 310.9 g 80 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5136A ✓

IPA IMP. CONTAINER I.D. 5137A ✓ LIQUID LEVEL MARKED _____

H_2O_2 IMP. CONTAINER I.D. 5138A ✓ LIQUID LEVEL MARKED _____

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5057A ✓	✓
H_2O_2	5058A ✓	✓
H_2O	5059A ✓	✓
Acetone	5060A ✓	✓

Samples stored and locked _____

Remarks _____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 11/30/82

Sample location Stack Recovery date 12/1/82

Run number 5cM5B Recovered by MCP/RA

Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W

Particulate filter number 0002696 ✓

Particulate filter sample I.D. 5139 B ✓

Probe rinse Acetone I.D. 5139A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	658.3 g	672.3 g	624.1 g	652.9 g	948.2 g
Initial wt	485.7 g	692.7 g	582.3 g	610.7 g	862.2 g
Net wt	____ g	____ g	____ g	____ g	____ g

Total moisture 322.2 g 95 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5139A ✓ ✓

IPA IMP. CONTAINER I.D. 5140A ✓ LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 5141A ✓ LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5057A ✓

H_2O_2 5058A ✓

H_2O 5059A ✓

Acetone 5060A ✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 11/30/82
Sample location Stack Recovery date 12/1/82
Run number 5DM5B Recovered by MCP/RA
Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W
Particulate filter number 002697 ✓
Particulate filter sample I.D. 5142B ✓
Probe rinse Acetone I.D. 5142A ✓
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	662.9 g	668.8 g	634.4 g	608.8 g	960.2 g
Initial wt	495.4 g	675.7 g	586.5 g	574.9 g	880.6 g
Net wt	____ g	____ g	____ g	____ g	____ g

Total moisture 322.0 g 90 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5142A ✓ ✓
IPA IMP. CONTAINER I.D. 5143A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 5144A ✓ LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5057A ✓	✓
H_2O_2	5058A ✓	✓
H_2O	5059A ✓	✓
Acetone	5060A ✓	✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date 12/1/82
Remarks [illegible]

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Mono Power
DATE 11/30/82 TEST NO 5
SAMPLING TIME (24-hr CLOCK) 1800
SAMPLING LOCATION Stack
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 60
OPERATOR Phillips
ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	12.0	12.0	11.8	11.8	11.8		11.9	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.6	6.6	18.7	6.9	6.9		6.8	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER - PLEASANTS	7/21/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
6AM5B	DO	55	29.18	-1.5	0002698	249	.84		10 F 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.219	2-03	12		FB1	1.77	1.037	6.0	.002			320	320		10

Pretest LC @ 15" → OK

P
TC 201
DR 124
OP

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	F	IMPINGER TEMPERATURE °F
	0	0941	759.748										
	10.		769.06	1.9	3.37	3.37	158	57	56	5.3	347	321	42
	20.		777.94	1.7	3.02	3.02	159	60	56	5.5	318	337	40
	30.		786.90	1.7	3.03	3.03	161	66	57	5.4	325	325	59
	40.		795.68	1.6	2.88	2.88	160	70	59	5.0	321	335	59
	50.		804.68	1.7	3.05	3.05	163	72	60	5.2	322	339	57
	60.		813.66	1.7	3.07	3.07	160	73	62	5.2	324	330	58
	70.		822.77	1.7	3.09	3.09	159	74	63	5.2	319	320	57
	80.		832.06	1.8	3.27	3.27	160	74	64	5.6	317	332	57
	90.		841.55	1.9	3.43	3.43	164	75	65	5.8	316	339	52
	100.		850.86	1.8	3.27	3.27	162	76	65	5.7	320	335	52
	110.		860.19	1.8	3.28	3.28	160	76	66	5.8	322	323	51
	120.	1141	869.461	1.8	3.26	3.26	164	76	66	5.7	325	331	50

5051 A&B RUN. NO. 6AM5B

1.33 3.17 161 66 + ~5F low

B-47

Reproduced from best available copy.

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONA POWER - PLEASANTS	12/1/82	UNIT 1	MSB

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
6BMSB	DIA	50	29.18	-.15	0002699	249	.84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	220	2-01	12		FB8	1.99	.998	8.0	.008		[illegible]	320	320		10

Pretest LC @ 15" → OK

P
TC 201
OP
DR 124
Pump - FB6

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F
	0	0942	494.232										
	10.		503.69	1.9	3.37	3.37	158	54	52	7.1	282	325	49
	20.		512.91	1.7	3.02	3.02	159	57	52	7.4	302	323	45
	30.		522.14	1.7	3.03	3.03	161	61	53	6.8	322	335	59
	40.		531.19	1.6	2.88	2.88	160	66	55	6.4	324	334	58
	50.		540.45	1.7	3.05	3.05	163	68	56	6.6	326	337	58
	60.		549.74	1.7	3.07	3.07	160	70	58	6.5	320	328	60
	70.		559.16	1.7	3.09	3.09	159	71	60	6.6	318	325	59
	80.		568.74	1.8	3.27	3.27	160	72	61	6.8	318	325	58
	90.		578.54	1.9	3.43	3.43	164	73	62	7.2	313	322	54
	100.		588.09	1.8	3.27	3.27	162	73	63	6.9	321	331	53
	110.		597.72	1.8	3.28	3.28	160	73	64	7.0	326	327	52
	120.	1142	607.315	1.8	3.26	3.26	164	74	64	7.0	326	330	52

5054 A&B RUN. NO. 6BMSB

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
[illegible] POWER, [illegible]	12/01/82	[illegible]	M5BW

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
6CM5BW	[illegible]	55	29.18	-.15	10002 7PP	24	.84	201	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	K FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.219	2.02	12		FB3	2.0	1.00	12	.001		2.1	5LP	320		10

Probe ok @15' Dilution 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F (FLTR/PRBE)	IMPINGER TEMPERATURE °F
	0	9:40	741.144									
	10.0	9:50	752.000	1.9	3.4	3.4	158	57	57	6.0	320/327	44
	20.0	10:00	759.990	1.7	3.05	3.1	159	62	56	6.0	311/356	40
	30.0	10:10	769.825	1.7	3.07	3.1	161	70	57	6.0	325/338	42
	40.0	10:20	778.700	1.6	2.9	2.9	160	76	58	5.5	322/338	42
	50.0	10:30	787.350	1.7	3.1	3.1	163	80	60	6.0	315/324	48
	60.0	10:40	795.426	1.7	3.1	3.1	160	81	61	6.0	316/323	48
	70.0	10:50	804.563	1.7	3.1	3.1	159	84	62	6.0	323/323	48
	80.0	11:00	813.795	1.8	3.3	3.3	160	86	64	6.0	314/323	46
	90.0	11:10	825.525	1.9	3.5	3.5	164	87	68	6.5	314/322	48
	100.0	11:20	834.410	1.8	3.3	3.3	162	88	68	6.0	324/323	48
	110.0	11:30	843.495	1.8	3.35	3.4	160	90	70	6.5	322/324	48
	120.0	11:40	853.815	1.8	3.3	3.3	164	90	70	6.0	314/323	46

5061 A&B RUN. NO. 6CM5BW

1.33 161 71 Imp. Therm 180200

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MERCED POWER PLEASANTS	12/9/82	UNIT 1	M5BW

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
6DM5BW	CLARKE	55	29.18	-1.5	0002706	40	84	201	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	L FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	241	2-07	12		F85	1.95	0.988	20	.002		214	329	349		19

Anchorage @ 15

Digital 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	9:40	443.657								FLTR/PROBE	
	10.0	9:50	445.725	1.9	3.4	3.4	158	60	60	7.0	317/358	44
	20.0	10:00	463.125	1.7	3.07	3.1	159	66	60	7.0	315/304	40
	30.0	10:10	473.615	1.7	3.08	3.1	161	72	60	7.0	316/324	40
	40.0	10:20	483.400	1.6	2.9	2.9	160	80	63	7.0	319/328	45
	50.0	10:30	492.429	1.7	3.1	3.1	163	82	66	7.0	315/329	48
	60.0	10:40	500.700	1.7	3.2	3.2	160	87	67	7.0	312/328	48
	70.0	10:50	510.475	1.7	3.2	3.2	159	88	69	7.0	319/320	48
	80.0	11:00	520.710	1.8	3.4	3.4	160	88	72	7.5	315/318	50
	90.0	11:10	532.600	1.9	3.5	3.5	164	90	72	8.0	312/314	52
	100.0	11:20	542.000	1.8	3.36	3.4	162	90	74	7.5	321/313	50
	110.0	11:30	551.010	1.8	3.31	3.4	160	90	74	7.5	319/315	46
	120.0	11:40	561.844	1.8	3.4	3.4	164	90	74	8.0	315/316	44

5064 A&B RUN. NO. 6DM5BW

B-50

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power — Sample date 12/1/82

Sample location Stack — Recovery date 12/1/82

Run number 6AM5B — Recovered by MCP/RA

Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W

Particulate filter number ~~50~~ 0002698 ✓

Particulate filter sample I.D. 5051B ✓

Probe rinse Acetone — I.D. 5051A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	680.1 g	675.1 g	646.2 g	659.1 g	948.4 g
Initial wt	502.2 g	678.7 g	594.5 g	613.5 g	880.6 g
Net wt	____ g	____ g	____ g	____ g	____ g

Total moisture 339.4 g — 95 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5051A ✓ ✓

IPA IMP. CONTAINER I.D. 5052A ✓ LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 5053A ✓ LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5057A ✓ ✓

H_2O_2 5058A ✓ ✓

H_2O 5059A ✓ ✓

Acetone 5060A ✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power — Sample date 12/1/82
Sample location Stack — Recovery date 12/1/82
Run number 6BM5B — Recovered by MCP/RA
Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W
Particulate filter number 0002699 ✓
Particulate filter sample I.D. 5054B ✓
Probe rinse Acetone — I.D. 5054A ✓
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	707.5 g	657.9 g	670.5 g	636.3 g	990.2 g
Initial wt	529.1 g	653.6 g	614.6 g	592.8 g	921.6 g
Net wt	____ g	____ g	____ g	____ g	____ g

Total moisture 350.7 g — 95 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5054A ✓
IPA IMP. CONTAINER I.D. 5055A ✓ — LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 5056A ✓ — LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. — LIQUID LEVEL MARKED

IPA	5057A ✓	✓
H_2O_2	5058A ✓	✓
H_2O	5059A	✓
Acetone	5060A ✓	✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] — Date [illegible]
Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/1/82

Sample location Stack Recovery date 12/1/82

Run number 6CM5BW Recovered by MCP/RA

Particulate sample type ____ M5 ____ M5-320 ____ M5-450 ✓ M5WBW

Particulate filter number 0002700 ✓

Particulate filter sample I.D. 5061B ✓

Probe rinse H_2O I.D. 5061A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	725.9 g	647.5 g	657.1 g	592.5 g	950.3 g
Initial wt	499.3 g	671.9 g	597.7 g	561.1 g	881.6 g
Net wt	____ g	____ g	____ g	____ g	____ g

Total moisture 361.7 g 95 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5061A ✓

IPA IMP. CONTAINER I.D. 5062A ✓ LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 5063A ✓ LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5057A ✓ ✓

H_2O_2 5058A ✓ ✓

H_2O 5059A ✓ ✓

Acetone 5060A N/A ✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date 12/3/82

Remarks [illegible] #034-20

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power — Sample date 12/1/82

Sample location Stack — Recovery date 12/1/82

Run number GDM5BW — Recovered by MCP/RA

Particulate sample type ____ M5 ____ M5-320 ____ M5-450 ✓ M5WBW

Particulate filter number 000270b ✓

Particulate filter sample I.D. 5064A ✓

Probe rinse H2O — I.D. ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	720.4 g	661.5 g	694.4 g	574.2 g	941.6 g
Initial wt	502.0 g	675.8 g	588.0 g	574.7 g	871.0 g
Net wt	____ g	____ g	____ g	____ g	____ g

Total moisture 340.6 g — 95 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5064A ✓

IPA IMP. CONTAINER I.D. 5065A ✓ — LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 5066A ✓ — LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. — LIQUID LEVEL MARKED

IPA	5057A ✓	✓
H_2O_2	5058A ✓	✓
H_2O	5059A ✓	✓
Acetone	5060A ✓	✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible]

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Mono Power
DATE 12/1/82 TEST NO #6
SAMPLING TIME (24-hr CLOCK) 1130
SAMPLING LOCATION Stack
SAMPLE TYPE (BAG) INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 55
OPERATOR MCP
ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	13.0	13.0	12.8	12.8	12.8	12.8	12.87	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.6	5.6	18.4	5.6	18.4	5.6	5.6	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONA POWER PLEASANTS	12/11/82	UNIT 1	MSB-P400

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
7AMSBP	DO	55	29.4	-15	000230	240	.84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.222	2-11	12		1884	1.83	1.032	10	0.06			400	320		12

Pretest LC @ 15" → OK

P 183
TC 201
DR 124
OP

SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD ($Δp_s$), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	F	IMPINGER TEMPERATURE °F
0	1242	869.665										
10.		878.80	1.7	3.16	3.16	161	63	63	5.5	401	324	43
20.		888.19	1.8	3.34	3.34	163	65	63	6.0	403	345	40
30.		897.60	1.8	3.36	3.36	162	70	63	6.2	395	325	48
40.		907.32	1.9	3.56	3.56	162	73	63	6.6	395	340	57
50.		917.04	1.9	3.56	3.56	163	76	65	6.5	400	328	63
60.		926.82	1.9	3.58	3.58	162	77	66	6.6	397	341	61
70.		936.36	1.8	3.40	3.40	161	78	67	6.2	398	326	63
80.		946.11	1.9	3.59	3.59	162	78	68	6.5	402	340	61
90.		955.61	1.8	3.40	3.40	163	79	68	6.2	400	326	57
100.		965.12	1.8	3.39	3.39	165	79	69	6.2	397	336	54
110.		974.63	1.8	3.39	3.39	164	79	69	6.2	393	341	54
120.	1442	984.300	1.9	3.55	3.55	170	79	70	6.5	397	325	56
			1.35		3.44	163	70					

~5F low

5067 A&B RUN. NO. 7AMSB-P400

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EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER PLEASANTS	12/1/87	UNIT 1	M5B-P400

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H₂O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
7BM5BP	D.O	55	29.14	-.15	0002703	249	.84		1 of 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.221	2-19	12		FB6	1.79	.998	9.0	.006			400	329		10

Pretest LC @ 16" → OK

P 183
TC 201
DZ 124
OP
Pump-FB6

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	F	IMPINGER* TEMPERATURE °F
	0	1243	607.517										
	10.		616.85	1.7	3.16	3.16	161	62	61	7.3	413	327	44
	20.		626.53	1.8	3.34	3.34	163	64	61	8.2	393	337	42
	30.		636.27	1.8	3.36	3.36	162	67	61	8.2	393	323	43
	40.		646.21	1.9	3.56	3.56	162	70	61	8.6	396	328	47
	50.		656.18	1.9	3.56	3.56	163	72	63	8.7	402	332	51
	60.		666.25	1.9	3.58	3.58	162	73	63	8.8	399	340	52
	70.		676.11	1.8	3.40	3.40	161	73	64	8.5	399	340	55
	80.		686.10	1.9	3.59	3.59	162	74	65	8.8	404	326	58
	90.		695.89	1.8	3.40	3.40	163	74	66	8.6	401	324	60
	100.		705.70	1.8	3.39	3.39	165	75	66	8.5	400	333	60
	110.		715.47	1.8	3.39	3.39	164	75	67	8.5	401	334	57
	120.	1443	725.407	1.9	3.55	3.55	170	75	67	8.8	400	339	56

5070 A&B RUN. NO. 7BM5B-P400

B-57

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* ~5F low

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MOUND ROAD ALLEGANS	12/01/84	[illegible]	M5B

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
7CM5B	CLARKE	55	29.14	-.15	990278E	24P	.84	401	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER Δ H @	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	A FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
15' GLASS	.333	2-0	14		FB3	2.00	1.006	10	.003		2.18	320	320		10

Prokofok @ 15'
Digital 128
Field 123

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F FLTR/PRBE	IMPINGER TEMPERATURE °F
	0	12:40	854.012									
	10.0	12:50	861.700	1.7	3.1	3.1	161	68	68	4.0	323/420	40
	20.0	13:00	870.870	1.8	3.26	3.3	163	72	64	7.0	316/322	38
	30.0	13:10	880.780	1.8	3.3	3.3	162	80	65	8.0	325/295	40
	40.0	13:20	890.725	1.9	3.5	3.5	162	85	65	8.0	325/327	42
	50.0	13:30	899.900	1.9	3.5	3.5	163	87	67	8.0	331/322	48
	60.0	13:40	910.245	1.9	3.5	3.5	162	88	68	8.0	330/321	52
	70.0	13:50	919.191	1.8	3.3	3.3	162	90	68	8.0	328/324	52
	80.0	14:00	928.858	1.9	3.5	3.5	162	90	70	8.5	317/320	56
	90.0	14:10	937.474	1.8	3.3	3.3	163	90	70	8.0	316/320	50
	100.0	14:20	947.878	1.8	3.3	3.3	165	91	71	8.0	320/318	50
	110.0	14:30	958.130	1.8	3.3	3.3	164	91	71	8.0	322/318	54
	120.0	14:40	967.794	1.9	3.5	3.5	170	91	71	8.5	328/318	54

5073 B+A FILTER NO. ______

RUN NO. 7CM5B ______ LAB NO. ______

Reproduced from best available copy.

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
ADIAGIO POWER ALLEGANTS	12/21/B4	H HIT V	M5B

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
7DM5B	CLARKE	55	29.4	TVS	PPP27105	240	.84	[illegible]	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	K FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.222	2-1	12P		FK	1.95	.9988	8	.004		2.1A	320	348		10

ok VACUUM 15"

Filter 183
Dig. Ind. 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in.H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in.H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in.H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in.Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	12:40	532.046								FLTR/PRBE	
	10.0	12:50	570.925	1.7	3.1	3.1	161	70	70	7.0	315/363	43
	20.0	13:00	581.270	1.8	3.28	3.3	163	72	70	7.5	320/280	40
	30.0	13:10	591.450	1.8	3.3	3.3	162	81	70	8.0	316/299	40
	40.0	13:20	600.525	1.9	3.5	3.5	162	86	71	8.0	314/308	44
	50.0	13:30	611.000	1.8	3.5	3.5	163	89	72	8.0	325/299	46
	60.0	13:40	622.351	1.9	3.54	3.5	162	90	74	8.0	323/314	48
	70.0	13:50	630.700	1.8	3.36	3.4	162	91	75	8.0	324/315	52
	80.0	14:00	641.525	1.9	3.5	3.5	162	91	75	8.0	318/316	56
	90.0	14:10	650.620	1.8	3.4	3.4	163	92	76	8.0	315/316	64
	100.0	14:20	661.626	1.8	3.4	3.4	165	93	77	8.0	320/312	66
	110.0	14:30	672.600	1.8	3.4	3.4	164	93	78	8.0	324/318	70
	120.0	14:40	683.522	1.9	3.5	3.5	170	94	78	8.0	326/313	68

5076 A&B RUN. NO. 7DM5B

Vop 1.35 163 80 Imping Therm Read 11°Good

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/1/82
Sample location Stack Recovery date 12/1/82
Run number 7AM5B-P400 Recovered by MCP/RA
Particulate sample type ____ M5 ____ M5-320 ✓ ~~M5-450~~ M5B-P400 ____ M5W
Particulate filter number 002702 ✓
Particulate filter sample I.D. 5067B ✓
Probe rinse Acetone I.D. 5067A ✓
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	692.0 g	660.5 g	645.5 g	636.3 g	930.4 g
Initial wt	490.2 g	672.4 g	~~604.8~~ 599.4 g	602.3 g	859.5 g
Net wt	201.8 g	-11.9 g	46.1 g	34.0 g	~~75~~ 70.9 g

Total moisture 340.9 g 95 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5067A ✓
IPA IMP. CONTAINER I.D. 5068A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 5067A ✓ LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5057A ✓	✓
H_2O_2	5058A ✓	
H_2O	5059A	✓
Acetone	5060A ✓	✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]
Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mona Power Sample date 12/1/82

Sample location Stack Recovery date 12/1/82

Run number 78M5B-P400 Recovered by MCP/RA

Particulate sample type ____ M5 ____ M5-320 ✓ ~~M5-450~~ M5B-P400 ____ M5W

Particulate filter number 0002703

Particulate filter sample I.D. 5070B

Probe rinse Acetone I.D. 5070A

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	696.9 g	659.3 g	661.7 g	647.7 g	941.9 g
Initial wt	489.7 g	665.5 g	603.5 g	612.8 g	872.9 g
Net wt	207.2 g	-6.2 g	58.2 g	34.9 g	69.0 g

Total moisture 363.1 g 95 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5070A

IPA IMP. CONTAINER I.D. 5071A LIQUID LEVEL MARKED ____

H_2O_2 IMP. CONTAINER I.D. 5072A LIQUID LEVEL MARKED ____

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5057A	✓
H_2O_2	5058A	✓
H_2O	5059A	✓
Acetone	5060A	✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date 12/3/82

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/1/82

Sample location Stack Recovery date 12/1/82

Run number 7CM5B Recovered by MCP/RA

Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W

Particulate filter number 0002704 ✓

Particulate filter sample I.D. 5073B ✓

Probe rinse Acetone I.D. 5073A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	722.1 g	649.5 g	642.1 g	630.3 g	942.6 g
Initial wt	485.7 g	696.6 g	597.8 g	597.9 g	864.8 g
Net wt	236.4 g	-47.1 g	44.3 g	32.4 g	77.8 g

Total moisture 343.8 g 90 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5073A ✓

IPA IMP. CONTAINER I.D. 5074A ✓ LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 5075A ✓ LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5057A ✓	✓
H_2O_2	5058A ✓	✓
H_2O	5059A	✓
Acetone	5060A ✓	✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks Reg. #03920

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/1/82
Sample location Stack Recovery date 12/1/82
Run number 7DM5B Recovered by MCP/RA
Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W
Particulate filter number 002705 ✓
Particulate filter sample I.D. 5076B ✓
Probe rinse Acetone I.D. 5076A ✓
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	726.1 g	654.6 g	610.0 g	623.4 g	943.5 g
Initial wt	497.3 g	675.6 g	571.7 g	589.5 g	854.8 g
Net wt	228.8 g	-51.0 g	38.3 g	33.9 g	88.7 g

Total moisture 338.7 g 70 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5076A ✓
IPA IMP. CONTAINER I.D. 5077A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 5078A ✓ LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5057A ✓	✓
H_2O_2	5058A ✓	✓
H_2O	5059A ✓	✓
Acetone	5060A ✓	✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date 12/3/82
Remarks [illegible]

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Mono Power
DATE 12/1/82 TEST NO 7
SAMPLING TIME (24-hr CLOCK) 1400
SAMPLING LOCATION Stack
SAMPLE TYPE (BAG) INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 60
OPERATOR MCF
ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	12.4	12.4	12.6	12.6	12.6	12.6	12.53	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.5	6.1	18.4	5.8	18.6	6.0	6.0	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER PLEASANTS	12/1/82	UNIT 1	M5BW

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
8AM5BW	DQ	60	29.14	-15	0002707	240	84		1 OF 1

P
TC 201
DR 124
OP

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	219	2-03	12	[illegible]	KB4	1.87	1.037	60	0.08			320	320		10

Stop test @ 44.5 min (~1630) - probe fixed / meter 24.192 → 24.551 / LC → OK
restart @ 1655 replaced

Pretest LC @ 15" → OK

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F
	0	1545	984.563										
	10.		993.67	1.7	3.05	3.05	164	65	65	4.8	387	342	46
	20.		2.44	1.6	2.87	2.87	163	67	65	4.4	329	318	40
	30.		11.24	1.6	2.89	2.89	163	72	65	4.4	315	321	41
	40.		20.25	1.7	3.09	3.09	162	76	65	4.7	245	316	42
	50.		29.44	1.6	2.91	2.91	162	78	67	4.6	287	322	44
	60.		38.72	1.8	3.25	3.25	163	70	67	5.0	325	327	43
	70.		48.04	1.8	3.26	3.26	161	73	67	5.0	319	320	47
	80.		57.57	1.9	3.44	3.44	165	77	67	5.3	333	321	51
	90.		67.18	1.9	3.46	3.46	162	79	68	5.5	332	323	55
	100.		77.03	2.0	3.66	3.66	162	80	69	5.8	324	326	60
	110.		87.54	1.9	3.46	3.46	166	80	70	5.7	323	327	66
	120.	~~1545~~ 1810	96.145	1.9	3.47	3.47	163	81	71	5.8	326	324	69
				1.33		3.23	163		71				

5082 A&B RUN. NO. 8AM5BW

* ~ 5F low

B-65

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EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER PLEASANTS	12/1/87	UNIT 1	M5BW

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
8BM5BW	DG	60	29.14	-1.5	000270F	240	.84		1 OF 1

P
TC 201
DR 124
OP
Pump FB6

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.250	Z-01	12		FB6	1.90	.998	10	.008			320	320		10

Pretest LC@16" → ok

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F
	0	1546	725.649										
	10.		734.87	1.7	3.05	3.05	164	64	63	5.8	291	334	50
	20.		743.87	1.6	2.87	2.87	163	66	63				
	30.		752.43	1.6	2.89	2.89	163	70	63	5.7	314	328	42
	40.		762.26	1.7	3.09	3.09	162	73	63	5.7	316	335	49
	50.		771.36	1.6	2.91	2.91	162	75	65	6.0	322	337	57
	60.		780.86	1.8	3.25	3.25	163	68	65	5.8	309	336	59
	70.		790.45	1.8	3.26	3.26	161	71	65	6.0	334	319	47
	80.		800.27	1.9	3.44	3.44	165	74	65	6.1	317	318	64
	90.		810.20	1.9	3.46	3.46	162	76	66	6.4	324	318	74
	100.		820.13	2.0	3.66	3.66	162	77	67	6.4	325	320	63
	110.6		830.56	1.9	3.46	3.46	166	78	68	6.7	325	318	53
	120.	~~1806~~ 1810	839.683	1.9	3.47	3.47	163	78	69	6.4	323	320	52
										6.6	326	319	51

5085 A&B RUN. NO. 8BM5BW

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MIDLAND POWER PLEASANTS	12/9/82	WALL	M5B

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE C_p	THERM NO.	PAGE
8CM5B	RUARK	55	29.4	-.15	00027109	240	.84	201	10 F 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	K FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.218	2-102	4.20		FB3	2.00	1.006	10	.015		2.14	320	320		10

Pretest OK@15"

Digital 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F FLTR PROBE	IMPINGER TEMPERATURE °F
	0	15:15	968.088									
	10.0	15:55	978.415	1.7	3.08	3.1	164	68	68	6.0	320/483	50
	20.0	16:05	985.825	1.6	2.9	2.9	163	74	64	5.5	308/357	40
	30.0	16:15	993.920	1.6	2.9	2.9	163	80	65	5.5	318/332	40
	*40.0	16:25	003.427	1.7	3.1	3.1	162	81	65	6.0	324/324	44
	50.0	17:00	014.220	1.6	2.95	3.0	162	86	66	6.0	313/330	50
	60.0	17:10	022.222	1.8	3.28	3.3	163	74	64	6.0	327/375	48
	70.0	17:20	031.611	1.8	3.3	3.3	161	79	66	6.0	300/289	48
	80.0	17:30	042.424	1.9	3.49	3.5	165	86	66	7.0	328/335	54
	90.0	17:40	051.298	1.9	3.5	3.5	162	90	68	7.0	309/330	60
	100.0	17:50	060.300	2.0	3.7	3.7	162	91	69	7.0	319/329	60
	110.0	18:00	071.348	1.9	3.5	3.5	166	92	70	8.0	319/328	60
	120.0	18:10	081.268	1.9	3.5	3.5	163	94	71	7.0	312/328	62
				1.83			163					

4154 A&B RUN. NO. 8CM5B

B-61

*Stopped @ 45 min for Probe Short Restart @ 16:58

$\bar{T}$ 175

Impinger Therm. 14° Low

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO DOWER DISTANT	12/01/84	UNIT 1	M5B

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (in. Hg)	STATIC PRESS (in. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE C_p	THERM NO.	PAGE
8D-M5B	CLARKE	55	29.1	-1.5	10032710	240	.84	201	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER Δ H @	METER CAL. FACTOR Y	LEAK CHECK in. Hg	LEAK CHECK CFM	K FACTOR	ℓ FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.221	2-07	12		582	1.95	.998	8.0	.004		2.18	320	320		10

Pitot tube @ 15" DIGITAL 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F
	0	15:45	683.746									
	10.0	15:55	684.585	1.7	3.1	3.1	164	73	73	5.0	323/472	44
	20.0	16:05	702.225	1.6	2.9	2.9	163	76	72	5.0	312/345	40
	30.0	16:15	711.315	1.6	2.96	3.0	163	82	72	5.0	317/353	40
	40.0	16:25	721.380	1.7	3.16	3.2	162	87	72	5.0	322/359	40
	50.0	17:00	733.700	1.6	3.0	3.0	162	90	74	5.0	318/360	40
	60.0	17:10	741.610	1.8	3.3	3.3	163	78	74	5.0	308/280	42
	70.0	17:20	750.895	1.8	3.35	3.4	161	84	74	5.5	317/284	40
	80.0	17:30	762.150	1.9	3.8	3.5	165	88	74	7.0	322/303	45
	90.0	17:40	771.900	1.9	3.56	3.6	162	92	76	7.0	324/315	48
	100.0	17:50	781.315	2.0	3.76	3.8	162	94	78	7.5	322/316	48
	110.0	18:00	793.000	1.9	3.65	3.6	166	94	78	7.0	320/315	59
	120.0	18:10	803.637	1.9	3.6	3.6	163	95	80	8.0	322/315	64

4157 A&B RUN. NO. 8DM5B

B-68

STOP ... [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/2/82

Sample location Stack Recovery date 12/2/82

Run number 8AM5BW Recovered by MCP

Particulate sample type ____ M5 ____ M5-320 ____ M5-450 ✓ M5BW

Particulate filter number 0002707

Particulate filter sample I.D. 5082B

Probe rinse H_2O I.D. 5083A

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	731.6 g	660.8 g	650.8 g	641.0 g	960.1 g
Initial wt	502.5 g	681.9 g	597.6 g	607.2 g	874.8 g
Net wt	229.1 g	-21.1 g	53.2 g	33.8 g	85.3 g

Total moisture 380.3 g 80 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5083A ✓

IPA IMP. CONTAINER I.D. 5082A LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 5084A ✓ LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5079A	✓
H_2O_2	5080A	✓
H_2O	5039A	✓
Acetone	5060A	✓

Samples stored and locked ____

Remarks IPA RINSE of FRONT FILTER BACK HALF INCLUDED IN PROBE RINSE.

LABORATORY CUSTODY

Received by [signature] Date 12/3/82

Remarks [illegible] #039220

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mesa Power Sample date 12/2/82
Sample location Stack Recovery date 12/2/82
Run number 8BM5BW Recovered by MCP
Particulate sample type ____ M5 ____ M5-320 ____ M5-450 ✓ M5BW
Particulate filter number 0002708
Particulate filter sample I.D. 5085B
Probe rinse H_2O I.D. 5085A
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	760.7 g	634.4 g	599.6 g	596.6 g	984.8 g
Initial wt	529.4 g	657.2 g	591.9 g	585.6 g	890.0 g
Net wt	231.3 g	-22[illegible].8 g	7.7 g	11.0 g	94.8 g

Total moisture 322.0 g 75 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 5085A
IPA IMP. CONTAINER I.D. 5086A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 5087A LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5077A	✓
H_2O_2	5080A	✓
H_2O	5059A	✓
Acetone	5060A MT	✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date 12/4/82
Remarks ____

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/2/82

Sample location Stack Recovery date 12/2/82

Run number 8CM5B Recovered by MCP

Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W

Particulate filter number 6002709 ✓

Particulate filter sample I.D. 4154B ✓

Probe rinse Acetone I.D. 4154A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	710.2 g	636.3 g	630.6 g	623.4 g	924.4 g
Initial wt	500.9 g	674.2 g	581.5 g	579.1 g	856.3 g
Net wt	209.3 g	-37.9 g	49.1 g	44.3 g	68.1 g

Total moisture 332.9 g 80 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4154A ✓

IPA IMP. CONTAINER I.D. 4155A ✓ LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 4156A ✓ LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5077A ✓

H_2O_2 5080A ✓ ✓

H_2O 5059A ✓

Acetone 5060A ✓ ✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks Log # 0234.20

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/2/82

Sample location Stack Recovery date 12/2/82

Run number 8DM5B Recovered by MCP

Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W

Particulate filter number 0002710

Particulate filter sample I.D. 4157B

Probe rinse Acetone I.D. 4157A

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	738.3 g	644.5 g	627.8 g	613.8 g	939.4 g
Initial wt	503.2 g	675.3 g	593.7 g	592.6 g	846.1 g
Net wt	235.1 g	-30.8 g	34.1 g	21.2 g	93.3 g

Total moisture 352.9 g 80 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4157A ✓

IPA IMP. CONTAINER I.D. 4158A LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 4159A LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5079A	✓
H_2O_2	5080A	✓
H_2O	5059A	✓
Acetone	5060A	✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible] #03920

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Mono Power
DATE 12/1/82 TEST NO 5
SAMPLING TIME (24-hr CLOCK) 1800
SAMPLING LOCATION Stack
SAMPLE TYPE (BAG) INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 58
OPERATOR MCP
ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	12.8	12.8	12.7	12.7	12.7	12.7	12.73	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.5	5.7	18.4	5.7	18.4	5.7	5.7	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

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EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER - PLEASANTS	12/2/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
9AM5B	DO	60	2933	-15	0002711	240	84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	222	2-11	12		F84	1.82	1.937	10	.006			320	320		10

Pretest LC @ 16" → OK

P 183
TC 201
DR 124
OP

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F *
	0	0931	96.377										
	10.		105.65	1.8	3.30	3.30	165	60	60	5.7	324	315	41
	20.		115.12	1.9	3.49	3.49	166	63	60	6.3	323	327	40
	30.		124.49	1.8	3.32	3.32	166	68	60	6.2	330	334	61
	40.		133.72	1.7	3.15	3.15	168	73	62	5.8	335	335	79
	50.		143.24	1.8	3.35	3.35	166	75	63	6.2	335	338	73
	60.		152.93	1.9	3.54	3.54	168	77	65	6.3	331	338	70
	70.		162.43	1.8	3.35	3.35	169	78	67	5.9	321	340	68
	80.		172.13	1.9	3.55	3.55	169	79	67	6.2	324	338	65
	90.		181.65	1.8	3.34	3.34	174	79	69	5.9	321	333	61
	100.		191.29	1.9	3.50	3.50	179	80	69	6.1	326	319	57
	110.		200.68	1.8	3.28	3.28	186	80	70	5.8	327	314	54
	120.	1131	210.393	1.9	3.54	3.54	173	81	71	6.2	331	326	54

4705 A&B RUN. NO. 9AM5B

B-71

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO POWER-PLEASANTS	12/2/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
9B M5B	DO	60	29.33	-1.5		240	84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO.	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	221	2-10	12		KBP	1.90	.998	.90	.008			320	320		10

Probe at LC @ 18" → OK

P 183
TC 201
DR 124
OR
Pump FB6

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	SAMPLE BOX TEMPERATURE °F F	IMPINGER TEMPERATURE °F *
	0	0932	839.988										
	10.		849.49	1.8	3.30	3.30	165	57	56	7.3	302	324	41
	20.		859.24	1.9	3.49	3.49	166	60	56	7.9	325	338	39
	30.		868.79	1.8	3.32	3.32	166	65	57	7.8	325	331	44
	40.		878.18	1.7	3.15	3.15	168	69	58	7.5	327	326	52
	50.		887.80	1.8	3.35	3.35	166	71	60	7.8	327	320	54
	60.		897.67	1.9	3.54	3.54	168	73	61	8.2	326	319	55
	70.		907.35	1.8	3.35	3.35	169	74	63	7.8	325	324	62
	80.		917.24	1.9	3.55	3.55	169	74	64	8.2	325	333	66
	90.		926.93	1.8	3.34	3.34	174	75	65	8.0	326	338	66
	100.		936.77	1.9	3.50	3.50	179	76	66	8.2	330	334	69
	110.		946.40	1.8	3.28	3.28	186	76	67	7.9	330	339	65
	120.	1132	956.299	1.9	3.54	3.54	173	77	67	8.3	331	339	65

470B A&B RUN. NO. 9B M5B

* ~5F low

66

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
[illegible]	12/22/82	UNIT [illegible]	M5B P4OP

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H₂O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
9CM5BP	KIUAAKG	60	29.33	-1.5	PPP2713	240	.84	221	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	K FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.220	2-09	12.0		FB3	2.0P	1.006	9.0	.001		2.1	40P	349		10

Anderson ok 15

DIGITAL 125
Pitot 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F FLTR / PROBE	IMPINGER TEMPERATURE °F
	0	9:30	093.666									
	10.0	9:40	102.600	1.8	3.2	3.2	165	60	60	8.0	318/414	56
	20.0	9:50	111.398	1.9	3.39	3.4	166	63	58	8.5	324/419	40
	30.0	10:00	121.525	1.8	3.2	3.2	166	70	58	8.0	314/409	44
	40.0	10:10	131.246	1.7	3.06	3.1	168	78	69	8.0	319/405	64
	50.0	10:20	139.320	1.8	3.26	3.3	166	80	62	8.0	326/404	64
	60.0	10:30	149.365	1.9	3.44	3.4	168	82	62	8.0	314/403	60
	70.0	10:40	159.555	1.8	3.3	3.3	169	84	64	8.0	319/410	58
	80.0	10:50	168.666	1.9	3.46	3.5	169	86	65	8.0	325/400	56
	90.0	11:00	178.820	1.8	3.25	3.3	174	86	65	8.0	316/398	52
	100.0	11:10	187.845	1.9	3.4	3.4	179	87	68	8.0	319/403	55
	110.0	11:20	197.677	1.8	3.2	3.2	186	88	67	8.0	327/407	56
	120.0	11:30	207.159	1.9	3.5	3.5	173	89	68	8.0	320/411	52

4711 A&B RUN. NO. 9CM5B-P4W

1.85 171

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONGO POWER PLEASANTS	12/02/82	UNIT 1 OUTLET	M5B-P40P

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
9DM5BP	CLARKE	60	29.33	-1.45	0002714	299	.842		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
10' GLASS	.220	2-1/2.1.2			FBS	1.85	.9988	10	.004		6.4	400	349		10

[illegible] .815

Digital 125
Pitot 183

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F (FLTR/PRBE)	IMPINGER TEMPERATURE °F
	0	9:30	815.288									
	10.0	9:40	824.800	1.8	3.2	3.7	165	63	63	8.0	321/408	52
	20.0	9:50	833.750	1.9	3.4	3.4	166	68	64	8.0	323/375	40
	30.0	10:00	844.725	1.8	3.26	3.3	166	76	64	8.0	318/402	38
	40.0	10:10	853.387	1.7	3.1	3.1	168	84	66	7.0	325/406	58
	50.0	10:20	826.826	1.8	3.3	3.3	166	87	69	7.5	320/402	56
	60.0	10:30	872.929	1.9	3.5	3.5	168	89	71	8.0	322/400	46
	70.0	10:40	884.244	1.8	3.3	3.3	169	91	73	8.0	317/398	48
	80.0	10:50	893.748	1.9	3.5	3.5	169	92	74	8.0	321/398	58
	90.0	11:00	904.265	1.8	3.3	3.3	179	92	75	7.5	317/395	58
	100.0	11:10	913.660	1.9	3.5	3.5	179	93	77	8.0	325/409	55
	110.0	11:20	924.924	1.8	3.3	3.3	186	95	78	8.0	326/411	58
	120.0	11:30	935.158	1.9	3.5	3.5	173	97	79	8.0	319/414	56

4702 A&B RUN. NO. 9DM5B-P400

1.35 171 78

Impinger Therm Reads 11° low

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QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/2/82

Sample location Stack Recovery date 12/2/82

Run number 9AM5B Recovered by MCP

Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W

Particulate filter number 0002711

Particulate filter sample I.D. 4705B

Probe rinse Acetone I.D. 4705A

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	696.6 g	660.6 g	638.4 g	622.5 g	932.3 g
Initial wt	491.8 g	671.5 g	612.3 g	594.1 g	837.6 g
Net wt	204.8 g	-10.9 g	26.1 g	28.4 g	94.7 g

Total moisture 343.1 g 85 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4705A

IPA IMP. CONTAINER I.D. 4706A LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 4707A LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5079A ✓

H_2O_2 5080A ✓

H_2O 5059A ✓

Acetone 5060A ✓

Samples stored and locked

Remarks

LABORATORY CUSTODY

Received by [illegible] Date 12/[illegible]/82

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/12/82

Sample location Stack Recovery date 12/2/82

Run number 9BM5B Recovered by MCP

Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W

Particulate filter number 0002712

Particulate filter sample I.D. 4708B

Probe rinse Acetone I.D. 4708A

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	693.0 g	643.2 g	645.9 g	659.1 g	939.7 g
Initial wt	490.9 g	666.8 g	599.5 g	619.9 g	852.0 g
Net wt	202.1 g	-23.6 g	46.4 g	39.2 g	87.7 g

Total moisture 351.8 g 85 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4708A

IPA IMP. CONTAINER I.D. 4709A LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 4710A LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5079A	✓
H_2O_2	5080A	✓
H_2O	5059A	✓
Acetone	5060A	✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mona Power Sample date 12/2/82
Sample location Stack Recovery date 12/2/82
Run number 9CM5B-P400 Recovered by MCP
Particulate sample type ____ M5 ____ M5-320 ✓ ~~M5-450~~ M5B-P400 ____ M5W
Particulate filter number 002713
Particulate filter sample I.D. 4711B
Probe rinse Acetone I.D. 4711A
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	677.6 g	665.6 g	646.3 g	644.2 g	927.8 g
Initial wt	485.8 g	696.7 g	595.4 g	602.6 g	839.6 g
Net wt	191.8 g	-31.1 g	50.9 g	41.6 g	88.2 g

Total moisture 341.4 g 80 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4711A
IPA IMP. CONTAINER I.D. 4712A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 4713A ✓ LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5079A	✓
H_2O_2	5080A	✓
H_2O	5059A	✓
Acetone	5060A	✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]
Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/2/82
Sample location Stack Recovery date 12/2/82
Run number 9DM5B-P400 Recovered by MCP
Particulate sample type ____ M5 ____ M5-320 ✓ ~~M5-450~~ M5B-P400 ____ M5W
Particulate filter number 000274 ✓
Particulate filter sample I.D. 4702B
Probe rinse Acetone I.D. 4702A
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	645.4 g	676.0 g	669.6 g	636.1 g	923.9 g
Initial wt	496.8 g	677.8 g	582.9 g	581.7 g	850.9 g
Net wt	148.6 g	-1.8 g	86.7 g	54.4 g	73 0 g

Total moisture 360.9 g 85 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4702A
IPA IMP. CONTAINER I.D. 4703A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 4704A ✓ LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5079A ✓	✓
H_2O_2	5080A	✓
H_2O	5059A	✓
Acetone	5060A	✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date 12/3/82
Remarks Log # 034020

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Mono Power
DATE 12/2/82 TEST NO 9
SAMPLING TIME (24-hr CLOCK) 1100
SAMPLING LOCATION Stack
SAMPLE TYPE (BAG) INTEGRATED, CONTINUOUS)
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 60
OPERATOR RA
ORSAT LEAK CHECKED ✓

COMMENTS:

RUN / GAS	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	12.2	12.8	13.0	13.0			12.9	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.6	5.8	18.7	5.7			5.75	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONO TOWER PLEASANTS	12/2/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H₂O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
10AM5B	DQ	68	29.38	-.15	0002715	242	.84		1 OF 1

P
TC 201
DF 124
OP

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	.219	12-03	12		FB1	NF1	1.032	10	.008			320	320		10

Probe LC @ 15' → OK

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F P	F	IMPINGER* TEMPERATURE °F
	0	1304	211.623										
	10.		221.20	1.9	3.40	3.40	166	68	67	5.1	351	344	52
	20.		230.69	1.9	3.34	3.34	170	71	67	5.1	329	334	45
	30.		240.02	1.8	3.24	3.24	168	76	68	4.9	326	340	45
	40.		249.76	2.0	3.61	3.61	169	79	69	5.3	317	337	47
	50.		259.36	1.9	3.42	3.42	172	80	70	5.2	310	336	48
	60.		269.14	2.0	3.61	3.61	170	81	71	5.6	330	329	57
	70.		278.94	2.0	3.63	3.63	170	82	72	5.8	343	332	54
	80.		288.56	1.9	3.44	3.44	171	83	73	5.5	339	338	59
	90.		297.94	1.8	3.33	3.33	160	85	74	5.2	334	337	63
	100.		307.62	1.9	3.49	3.49	164	85	75	5.7	319	336	66
	110.		317.56	2.0	3.69	3.69	170	87	76	6.0	316	333	72
	120.	1504	327.698	2.1	3.86	3.86	167	87	77	6.3	313	331	75
				1.39		3.51	168	76					

* ~5F low

4730 A&B RUN. NO. 10AM5B

Reproduced from best available copy.

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MIAMI POWER PLEASANTS	12/2/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB. TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE C_p	THERM NO.	PAGE
10BM5B	DA	68	29.38	-.15	000271G	249	.84		1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	C FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
5' GLASS	.229	2-9	12		RBB	1.90	.998	15	.006			320	320		10

Pretest LC @ 15" → OK

P
TC 201
DR124
OP
Pump FB6

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F (P)	SAMPLE BOX TEMPERATURE °F (F)	IMPINGER TEMPERATURE °F
	0	1305	956.543										
	10		966.28	1.9	3.40	3.40	166	65	64	5.9	290	341	57
	20		975.94	1.9	3.39	3.39	170	68	64	6.1	305	341	47
	30		985.52	1.8	3.24	3.24	168	72	65	6.1	309	330	45
	40		995.53	2.0	3.61	3.61	169	76	66	6.6	308	334	49
	50		5.36	1.9	3.42	3.42	172	77	67	6.4	303	338	52
	60		15.42	2.0	3.61	3.61	170	78	68	6.7	304	327	56
	70		25.49	2.0	3.63	3.63	170	78	69	6.8	306	327	55
	80		35.32	1.9	3.44	3.44	171	80	70	6.6	305	338	58
	90		45.07	1.8	3.33	3.33	160	81	71	6.5	304	340	62
	100		55.01	1.9	3.49	3.49	164	82	73	6.8	303	329	64
	110		65.20	2.0	3.69	3.69	170	83	73	7.0	305	337	67
	120	1505	75.570	2.1	3.86	3.86	167	83	74	7.3	305	341	69

4733 A&B RUN. NO. 10BM5B

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
[illegible] POWER PLEASANTS	12/02/82	UNIT 1	M5B

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE C_p	THERM NO.	PAGE
10CM5B	KLAPKE	60	29.38	-7.5	10102717	EAR	.84	2-31	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	K FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
15' GLASS	.219	2-09	12		FB3	2.00	1.006	10	.012		2.19	32	32		10

OK @ 15 Pre-test

DIGITAL 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F FLTR / PRBE	IMPINGER TEMPERATURE °F
	0	13:00	207.427									
	10.0	13:10	217.190	1.9	3.4	3.4	166	66	66	6.5	322/417	52
	20.0	13:20	226.417	1.9	3.4	3.4	170	72	66	6.5	308/359	54
	30.0	13:30	235.595	1.8	3.2	3.2	168	79	68	6.0	316/300	46
	40.0	13:40	245.940	2.0	3.68	3.7	169	83	69	7.0	317/364	48
	50.0	13:50	255.555	1.9	3.46	3.5	172	87	69	7.0	318/323	50
	60.0	14:00	265.450	2.0	3.67	3.7	170	89	70	7.5	312/314	50
	70.0	14:10	275.325	2.0	3.7	3.7	170	90	71	7.0	313/317	54
	80.0	14:20	285.635	1.9	3.5	3.5	171	91	71	7.0	313/322	52
	90.0	14:30	294.464	1.8	3.36	3.4	160	91	71	7.0	312/322	56
	100.0	14:40	304.625	1.9	3.5	3.5	164	92	73	7.5	313/321	56
	110.0	14:50	314.144	2.0	3.7	3.7	170	92	73	7.5	313/329	54
	120.0	15:00	324.450	2.1	3.87	3.9	167	93	73	8.5	319/318	58

4736 A&B RUN. NO. 10CM5B

1.39 168 84.7 Impinger Therm. Read 1° low

EMISSION TESTING FIELD DATA

PLANT & CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE
MONGO HOWER PLEASANTS	12/02/82	WHITT	MSB

RUN NO.	OPERATOR	AMB TEMP (°F)	BAR. PRESS. (IN. Hg)	STATIC PRESS (IN. H_2O)	FILTER NUMBER(S)	STACK INSIDE DIMEN. (INCHES)	PITOT TUBE Cp	THERM NO.	PAGE
10DMSB	CLARKE	60	28.38	-1.6	6002719	240	84	701	1 OF 1

PROBE LENGTH AND TYPE	NOZZLE I.D.	NOZZLE NO.	H_2O (%)	SAMPLE BOX NO	METER BOX NO.	METER ΔH@	METER CAL. FACTOR Y	LEAK CHECK IN. Hg	LEAK CHECK CFM	K FACTOR	L FACTOR	PROBE HEAT SET	BOX HEAT SET	REF. ΔP	RECORD DATA MINS
6' GLASS	221	2-07	12		FBS	157	0588	10	.004		214	320	320		10

Probe ok @22"

DIGITAL 125

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE °F FLTR/PRBE	IMPINGER TEMPERATURE °F
	0	13:00	935.684									
	10.0	13:10	946.222	1.9	3.47	3.5	166	74	74	8.0	320/406	56
	20.0	13:20	956.820	1.9	3.45	3.5	170	77	73	8.0	318/334	42
	30.0	13:30	966.275	1.8	3.3	3.3	168	85	73	7.5	301/314	44
	40.0	13:40	976.340	2.0	3.7	3.7	169	[illegible]	75	8.0	302/312	48
	50.0	13:50	987.810	1.9	3.5	3.5	172	95	76	8.0	305/319	48
	60.0	14:00	997.601	2.0	3.7	3.7	170	96	78	8.0	307/316	52
	70.0	14:10	007.653	2.0	3.7	3.7	170	98	80	8.0	309/320	48
	80.0	14:20	018.780	1.9	3.5	3.5	171	98	80	8.0	[illegible]/321	54
	90.0	14:30	028.528	1.8	3.4	3.4	160	99	82	8.0	310/322	54
	100.0	14:40	038.758	1.9	3.6	3.6	164	100	84	8.0	309/320	56
	110.0	14:50	049.049	2.0	3.7	3.7	170	100	83	8.0	308/323	58
	120.0	15:00	060.981	2.1	4.0	4.0	167	100	85	9.0	309/320	62

4739 A&B RUN. NO. 10DMSB

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power   Sample date 12/2/82

Sample location Stack   Recovery date 12/2/82

Run number 10AM5B   Recovered by MCP

Particulate sample type ✓ M5B ___ M5-320 ___ M5-450 ___ M5W

Particulate filter number 0002715 ✓

Particulate filter sample I.D. 4730B ✓

Probe rinse Acetone   I.D. 4730A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	~~738.3~~ 740.0 g	649.6 g	639.9 g	642.9 g	980.9 g
Initial wt	503.8 g	674.3 g	596.8 g	610.9 g	887.2 g
Net wt	g	g	g	g	g

Total moisture 380.3 g   90 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4730A ✓

IPA IMP. CONTAINER I.D. 4731A ✓   LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 4732A ✓   LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D.   LIQUID LEVEL MARKED

IPA 5079A ✓

H_2O_2 5080A ✓

H_2O 5059A ✓

Acetone 5060A ✓

Samples stored and locked

Remarks

LABORATORY CUSTODY

Received by [illegible signature]   Date [illegible]

Remarks [illegible] # 034.36, acetone probe rinse #4730A [illegible] (< 5% of sample volume) LOST.

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/2/82
Sample location Stack Recovery date 12/2/82
Run number 103M5B Recovered by MCP
Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W
Particulate filter number 0002716 ✓
Particulate filter sample I.D. 4733B ✓
Probe rinse Acetone I.D. 4733A ✓
Purge train 20 min (check when completed) ✓
Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	758.7 g	638.1 g	645.4 g	640.1 g	956.2 g
Initial wt	529.7 g	656.7 g	604.6 g	604.8 g	870.5 g
Net wt	____ g	____ g	____ g	____ g	____ g

Total moisture ~~377.2~~ g 85 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4733A ✓
IPA IMP. CONTAINER I.D. 4734A ✓ LIQUID LEVEL MARKED ✓
H_2O_2 IMP. CONTAINER I.D. 4735A ✓ LIQUID LEVEL MARKED ✓
BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA 5079A ✓
H_2O_2 5080A ✓
H_2O 5059A ✓
Acetone 5060A ✓

Samples stored and locked ____
Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]
Remarks [illegible]

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/2/82

Sample location Stack Recovery date 12/2/82

Run number 10CM5B Recovered by MCP

Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W

Particulate filter number 002717 ✓

Particulate filter sample I.D. 4735B ✓

Probe rinse Acetone I.D. 4736A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd & 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	~~736.2~~ 743.8 g	644.~~8~~1 g	~~627.8~~ 646.1 g	~~643.8~~ 622.7 g	~~959.4~~ 948.7 g
Initial wt	503.3 g	679.0 g	596.6 g	591.6 g	859.8 g
Net wt	____ g	____ g	____ g	____ g	____ g
Total moisture			~~345.5~~ 325.5 g		85 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4736A ✓

IPA IMP. CONTAINER I.D. 4737A ✓ LIQUID LEVEL MARKED ____

H_2O_2 IMP. CONTAINER I.D. 4738A ✓ LIQUID LEVEL MARKED ____

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5079A ✓	✓
H_2O_2	5058A ✓	
H_2O	5059A ✓	✓
Acetone	5060A ✓	

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible] (~ 20-25% of sample volume used)

QUAD TRAIN SAMPLE RECOVERY AND INTEGRITY SHEET

Plant Mono Power Sample date 12/2/82

Sample location Stack Recovery date 12/2/82

Run number 10DM5B Recovered by MCP

Particulate sample type ✓ M5B ____ M5-320 ____ M5-450 ____ M5W

Particulate filter number 0x10 27 18 ✓

Particulate filter sample I.D. 4739B ✓

Probe rinse Acetone I.D. 4739A ✓

Purge train 20 min (check when completed) ✓

Location of filter in back half Between 2nd + 3rd Impingers

MOISTURE

	1st impinger	2nd impinger	3rd impinger	4th impinger	Silica gel
Final wt	740.9 g	648.6 g	623.4 g	615.1 g	969.2 g
Initial wt	501.5 g	673.0 g	579.9 g	580.0 g	877.1 g
Net wt	____ g	____ g	____ g	____ g	____ g

Total moisture 385.7 g 85 % spent

RECOVERED SAMPLE

PROBE RINSE CONTAINER I.D. 4739A ✓

IPA IMP. CONTAINER I.D. 4740A ✓ LIQUID LEVEL MARKED ✓

H_2O_2 IMP. CONTAINER I.D. 4741A ✓ LIQUID LEVEL MARKED ✓

BLANK CONTAINER(S) I.D. LIQUID LEVEL MARKED

IPA	5079A ✓	✓
H_2O_2	5080A ✓	✓
H_2O	5059A ✓	✓
Acetone	5060A ✓	✓

Samples stored and locked ____

Remarks ____

LABORATORY CUSTODY

Received by [illegible] Date [illegible]

Remarks [illegible] (~259 g sample volume lost).

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Mono Power

DATE 12/2/82 TEST NO 1C

SAMPLING TIME (24-hr CLOCK) 1400

SAMPLING LOCATION Stack

SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS)

ANALYTICAL METHOD Orsat

AMBIENT TEMPERATURE 65

OPERATOR MCF

ORSAT LEAK CHECKED ✓

COMMENTS:

GAS \ RUN	1		2		3		AVERAGE NET VOLUME	MULTIPLIER	MOLECULAR WEIGHT OF STACK GAS (DRY BASIS) M_d, lb lb-mole
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET			
CO_2	12.6	12.6	12.6	12.6			12.6	44/100	
O_2 (NET IS ACTUAL O_2 READING MINUS ACTUAL CO_2 READING)	18.6	6.0	18.5	6.1			6.05	32/100	
CO (NET IS ACTUAL CO READING MINUS ACTUAL O_2 READING)								28/100	
N_2 (NET IS 100 MINUS ACTUAL CO READING)								28/100	
								TOTAL	

GAS VELOCITY AND VOLUME DATA

1.

PLANT AND CITY	RUN DATE
Pleasants Stn.	11 / 29 / 82

SAMPLING LOCATION	CLOCK TIME
Unit	0840

2.

RUN NUMBER	OPERATOR	AMB. TEMP. (°F)	BAR. PRESS (in. Hg)	STATIC PRESS (in. H_2O)
V-1	DO/PC	52	28.94	−1.5

MOLECULAR WT.	STACK INSIDE DIMENSION (in.) DIAM OR SIDE 1	STACK INSIDE DIMENSION (in.) SIDE 2	PITOT TUBE Cp	MOISTURE %
			.84	~~5~~ 12.

FC 206
P 041
DR 125

PITOT LEAK CHECK + ✓ − ✓

P_s = −1.5

LOAD = ~450 MW Net

FIELD DATA

TRAVERSE POINT NUMBER	POSITION (in.)	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMP, °F
7, 8, 9, 10	11, 12, 13, 14	25, 26, 27, 28, 29	38, 39, 40, 41
		1.9	144
1	24	2.0	144
2	3	2.0	144
3	36	1.9	144
4	~~42~~	1.9	145
5	48		

APPENDIX C

LABORATORY RESULTS

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S EPA - MONO POWER
Run No. 1AM5B
Sample location
Analyst C. JONES
Relative humidity 50%
Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR373	BLK 1+2	4971A	272 ml's	106480.7
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR342	1AM5B	4970A	282 ml's	103397.5
Filter blank	CR341	BLANK	- - -	0002119	348.5
Filter	CR309A	1AM5B	4970B	0002756	353.0

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR373	3.7	1.1	2	1.6	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR342	21.7	11.3	2	6.8	2	5.6	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR309A	4.2	2.6	2	2.0	2	1.3	2
Total particulate		25.9	13.9		8.8		6.9	

Remarks
Data reviewed by T.J.W.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power — Run No. 1BM5B
Sample location — Analyst C. Jones
Relative humidity 50% — Density of acetone (ρa) .7905 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR373	BIK 1+2	4971A	272 ml's	106480.7
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR343	1BM5B	4972A	228 ml's	107335.3
Filter blank	CR341	Blank	---	0002719	348.5
Filter	CR310A	1BM5B	4972B	0002755	352.1

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR373	3.7	1.1	2	1.6	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR343	75.8	14.3	2	9.2	2	8.1	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR310A	3.9	1.7	2	1.1	2	0.8	2
Total particulate		79.7	16.0		10.3		8.9	

Remarks
Data reviewed by T.J.W.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS

PN 3530-15

Plant U.S. EPA - MONO POWER

Run No. 2AM5B-P400

Sample location

Analyst C. JONES

Relative humidity 50%

Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR373	BLK 1+2	4971A	272 ml's	106480.7
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR344	2AM5B-P400	4971A	355 ml's	10734.0.2
Filter blank	CR341	BLANK		0002719	348.5
Filter	CR311A	2AM5B-P400	4971B	0002692	347.0

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR373	3.7	1.1	2	1.6	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR344	24.9	14.4	3	14.9	2	11.8	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR311A	4.2	2.8	2	2.4	2	2.3	2
Total particulate		29.1	17.2		17.3		14.1	

Remarks

Data reviewed by T.F.K.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

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THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S EPA - Mono Power
Run No. 2BM5B-P400
Sample location
Analyst C. Jones
Relative humidity 50%
Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR373	BIK 142	4971A	272 ml's	106480.7
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR345	2BM5B P400	4994A	306 ml's	107198.1
Filter blank	CR341	BLANK	—	0002719	348.5
Filter	CR312A	2BM5B-P400	4994B	0002683	348.7

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR373	3.7	1.1	2	1.6	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR345	21.1	8.7	2	5.4	2	4.3	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR312A	5.1	3.9	2	3.3	2	2.7	2
Total particulate		26.2	12.6		8.7		7.0	

Remarks
Data reviewed by T.J.N.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power Run No. 2CM5B
Sample location Analyst C. Jones
Relative humidity 50% Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR373	BIK 1+2	4971A	272 ml's	106480.7
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR346	2CM5B	4997A	330 ml's	102637.5
Filter blank	CR341	Blank	———	0002719	348.5
Filter	CR313A	2CM5B	4997B	0002694	350.2

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR373	3.7	1.1	2	1.6	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR346	48.9	14.3	3	16.3	2	11.7	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR313A	7.7	3.9	3[a]	3.1	2	2.9	2
Total particulate		56.6	18.2		19.4		14.6	

Remarks [a] only two heatings were required to meet stable weight criteria of ± 5.0 mg. The third heating was an attempt to meet ± 0.5 mg. 1-24-83 [illegible]

Data reviewed by [illegible] T.J.R.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS

PN 3530-15

Plant U.S. EPA - MONO Power — Run No. 2DM5A

Sample location — Analyst C. JONES

Relative humidity 50% — Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR373	BLK 1+2	4971A	272 ml's	106480.7
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR347	2DM5B	5000A	273 ml's	105196.2
Filter blank	CR341	BLANK	——	0002719	348.5
Filter	CR314A	2DM5B	5000B	0002685	348.3

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR373	3.7	1.1	2	1.6	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR347	29.0	8.0	2	5.6	2	3.0	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR314A	5.3	3.8	2	3.5	2	2.4	2
Total particulate		34.3	11.8		9.1		5.4	

Remarks

Data reviewed by T.J.R.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power — Run No. 3CM5B
Sample location — Analyst C. Jones
Relative humidity 50% — Density of acetone (pa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR374	BLK 3+4	5126A	208 ml's	105189.4
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR348	3CM5B	5109A	338 ml's	106311.4
Filter blank	CR341	Blank	—	0002719	348.5
Filter	CR315A	3CM5B	5106B	0002689	348.8

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR374	2.7	0.5	2	0.4	2	-1.5	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR348	51.0	—	—	—	—	4.6	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR315A	7.8	—	—	—	—	3.5	2
Total particulate		58.8	—		—		13.1	

Remarks
Data reviewed by T. F. N.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - MoNO Power Run No. 3DMSB

Sample location _____ Analyst C. Jones

Relative humidity 50% Density of acetone (pa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR374	BLK B+4	5126A	208.ml's	105189.4
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR349	3DMSB	5112A	337 ml's	102187.3
Filter blank	CR341	BLANK	——	0002719	348.5
Filter	CR316A	3DMSB	5112B	0002688	348.0

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR374	2.7	0.5	2	0.4	2	-1.5	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR349	61.9	——	——	——	——	22.2	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR316A	7.7	——	——	——	——	4.4	2
Total particulate		69.6	——		——		26.6	

Remarks _____

Data reviewed by _____ T.J.T.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power
Sample location
Relative humidity 50%
Run No. 4AM5B
Analyst C. Jones
Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR374	Blk 3+4	5126A	208 ml's	105189.4
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR350	4AM5B	5116A	464 ml's	104683.1
Filter blank	CR341	Blank	—	0002719	348.5
Filter	CR317A	4AM5B	5116B	0002640	348.4

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR374	2.7	0.5	2	0.4	2	-1.5	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR350	20.3	—	—	7.4	2	6.8	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR317A	6.4	—	—	4.7	2	4.2	2
Total particulate		26.7	—		12.1		11.0	

Remarks
Data reviewed by T.C.M.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 353015

Plant U.S. EPA - Mono Power — Run No. 4BM5B

Sample location — Analyst C. Jones

Relative humidity 50% — Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR374	Blk 3+4	5126A	208 ml's	105189.4
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR351	4BM5B	5114A	423 ml's	106874.5
Filter blank	CR341	Blank	—	0002714	348.5
Filter	CR318A	4BM5B	5114B	0002692	344.9

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR374	2.7	0.5	2	0.4	2	-1.5	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR351	19.9	—	—	—	—	7.1	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR318A	6.8	—	—	—	—	4.1	2
Total particulate		26.7	—		—		11.2	

Remarks

Data reviewed by T.J.H.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS

PN 3530-15

Plant U.S. EPA - Mono Power — Run No. 4CM5B-P400

Sample location — Analyst C. Jones

Relative humidity 50% — Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR374	BLK 3+4	5126A	208 ml's	105189.4
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR352	4CM5B-P400	5127A	253 ml's	109915.6
Filter blank	CR341	BLANK	----	0002719	348.5
Filter	CR314A	4CM5B-P400	5127B	0002691	347.4

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR374	2.7	0.5	2	0.4	2	-1.5	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR352	33.2	—	—	13.3	2	11.0	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR314A	7.6	—	—	5.3	2	4.8	2
Total particulate		40.8	—		18.6		15.8	

Remarks

Data reviewed by T.J.V.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS

PN 3530.15

Plant U.S. EPA - Mono Power — Run No. 4DMSB-P400

Sample location — Analyst C. Jones

Relative humidity 50% — Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR374	BLK 3+4	5126A	208 ml's	105189.4
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR353	4DMSB-P400	5130A	225 ml's	104618.0
Filter blank	CR341	BLANK	—	0002719	348.5
Filter	CR320A	4DMSB-P400	5130B	0002643	345.8

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR374	2.7	0.5	2	0.4	2	-1.5	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR353	20.4	—	—	—	—	8.6	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR320A	6.8	—	—	—	—	3.8	2
Total particulate		27.2	—		—		12.4	

Remarks

Data reviewed by T.J.M.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530 15

Plant U.S. EPA - Mono Power
Run No. 5AM5B
Sample location
Analyst C. Jones
Relative humidity 50%
Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	Blk 5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR354	5AM5B	5133A	423ml's	108915.3
Filter blank	CR341	Blank	———	0002719	348.5
Filter	CR321	5AM5B	5133B	0002694	348.1

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR354	40.3	15.5	2	12.4	2	9.8	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR321	7.3	5.6	2	4.7	2	4.9	2
Total particulate		47.6	21.1		17.1		14.7	

Remarks
Data reviewed by

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power — Run No. 5BM5B

Sample location — Analyst C. Jones

Relative humidity 50% — Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BLK 5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR355	5BM5B	5136A	272 ml's	105413.6
Filter blank	CR341	BLK	——	0002719	348.5
Filter	CR322	5BM5B	5136B	0002695	340.6

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR355	39.0	11.3	3	13.3	2	9.7	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR322	7.2	5.0	2	4.6	2	4.2	2
Total particulate		46.2	16.3		17.9		13.9	

Remarks

Data reviewed by T.J.R.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - MONO POWER
Run No. SCM5B
Sample location
Analyst C. JONES
Relative humidity 50%
Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR 375	BIK5-10	5060 A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR 356	SCM5B	5134A	374 ml's	106821.4
Filter blank	CR 341	BLANK	——	0002719	348.5
Filter	CR 323	SCM5B	5134B	0002696	346.0

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR 375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR 356	45.5	—	—	11.9	2	9.0	2
Filter blank	CR 341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR 323	8.5	—	—	5.2	2	4.2	2
Total particulate		54.0	—		17.1		13.2	

Remarks
Data reviewed by T.J.A.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS

PN 3530-15

Plant U.S. EPA - Mono Power — Run No. 5DM5B

Sample location — Analyst C. Jones

Relative humidity 50% — Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR 375	BLK 5-10	5060 A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR 357	5DM5B	5142A	293 ml's	107423.2
Filter blank	CR 341	BLANK	—	000279	348.5
Filter	CR 324	5DM5B	5142B	000297	348.4

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR 375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR 357	40.8	—	—	12.3	2	9.3	2
Filter blank	CR 341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR 324	7.4	—	—	4.1	2	3.9	2
Total particulate		48.2	—		16.4		13.2	

Remarks

Data reviewed by T.J.G.

These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS

PN 3530-15

Plant U.S. EPA - Mono Power — Run No. 6AM5B

Sample location — Analyst C. Jones

Relative humidity 50% — Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375 ✓	BIK 5-10 ✓	5060A ✓	316 ml's ✓	103410.0 ✓
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR358 ✓	6AM5B ✓	5051A ✓	291 ml's ✓	105606.2 ✓
Filter blank	CR341 ✓	Blank ✓	—	0002719 ✓	348.5 ✓
Filter	CR325 ✓	6AM5B ✓	5051B ✓	0002698 ✓	347.6 ✓

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375 ✓	2.8 ✓	1.9 ✓	2 ✓	1.4 ✓	2 ✓	0.8 ✓	2 ✓
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR358 ✓	25.6 ✓	18.1 ✓	2 ✓	15.4 ✓	2 ✓	12.8 ✓	2 ✓
Filter blank	CR341 ✓	0.2 ✓	-0.1 ✓	2 ✓	0.0 ✓	2 ✓	-0.1 ✓	2 ✓
Filter	CR325 ✓	8.0 ✓	6.4 ✓	2 ✓	5.5 ✓	2 ✓	5.0 ✓	2 ✓
Total particulate		33.6 ✓	24.5 ✓		20.9 ✓		17.8 ✓	

Remarks

Data reviewed by T.J.R.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power
Run No. 6BM5B
Sample location
Analyst C. Jones
Relative humidity 50%
Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BLK 5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR359	6BM5B	5054A	334 ml's	106293.1
Filter blank	CR341	Blank	——	0002719	348.5
Filter	CR326	6BM5B	5054B	0002699	346.9

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR359	23.3	14.0	2	10.5	2	6.9	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR326	10.5	5.5	3"	5.0	2	4.7	2
Total particulate		33.8	19.5		15.5		11.6	

Remarks a only two heatings were required to meet criteria of ± 5.0 mg. The third heating was an effort to obtain ± 0.5 mg. 1-24-83 BM/CJ.

Data reviewed by [illegible] T.J.W.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power — Run No. 7AM5B-P400
Sample location — Analyst C. Jones
Relative humidity 50% — Density of acetone (pa) 7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BLK 5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR360	7AM5B P400	5067A	256 ml's	106500.6
Filter blank	CR341	BLANK	---	0002719	348.5
Filter	CR 327	7AM5B P400	5067B	0002702	346.8

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR360	37.0	20.8	2	17.0	2	11.0	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR327	9.4	5.7	2	5.0	2	4.7	2
Total particulate		46.4	26.5		22.0		15.7	

Remarks
Data reviewed by T.J.N.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530 15

Plant U.S. EPA - Mono Power Run No. 7BMSB-P400
Sample location Analyst C. Jones
Relative humidity 50% Density of acetone (ρa) 7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BIK 5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR361	7BMSB-P400	5070A	274 ml's	110501.3
Filter blank	CR341	Blank	—	0002719	348.5
Filter	CR328	7BMSB-P400	5070B	0002703	346.8

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR361	24.6	12.1	3[a]	12.6	2	10.7	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR328	13.4	8.4	3[a,b]	6.7	2	6.4	2
Total particulate		38.0	20.5		19.3		17.1	

Remarks [a] only two heatings were required to meet a criteria of ±5.0 mg. [b] The third heating was an effort to meet ±0.5 mg. 1-27-83 [illegible]/CJ

Data reviewed by [illegible] T.J.R.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA- Mono Power
Run No. 7CM5B
Sample location
Analyst C Jones
Relative humidity 50%
Density of acetone (ρa) 7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BIK 5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR362	7CM5B	5073A	238 ml's	105056.0
Filter blank	CR341	Blank	—	0002719	348.5
Filter	CR329	7CM5B	5073B	0002704	348.6

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR362	69.4	22.4	2	17.6	2	8.6	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR329	10.6	6.2	3[a]	4.8	2	5.0	2
Total particulate		80.0	28.6		22.4		13.6	

[a] Two heatings met criteria of ± 3.0 mg. The third heating was an effort to meet ± 0.5 mg. 1-24-83 fm³/c J.

Remarks

Data reviewed by T.J.W.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS

PN 3520-15

Plant U.S. EPA - Mono Power

Sample location

Relative humidity 50%

Run No. 7DM5B

Analyst C. Jones

Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BLK 5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR363	7DM5B	5076A	320ml's	105517.1
Filter blank	CR341	BLANK	———	0002719	348.5
Filter	CR330	7DM5B	5076B	0002705	344.5

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR363	75.2	23.7	3	23.4	2	20.3	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR330	11.1	7.6	2	7.0	2	6.2	2
Total particulate		86.3	31.3		30.4		26.5	

Remarks

Data reviewed by T.J.R.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power — Run No. BCM5B

Sample location — Analyst C. Jones

Relative humidity 50% — Density of acetone (pa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR 375	BLK 5-10	5060 A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR 364	BCM5B	4154 A	223 ml's	108549.0
Filter blank	CR 341	Blank	—	0002714	348.5
Filter	CR 331	BCM5B	4154B	0002709	348.1

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR 375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR 364	79.2	12.3	3	13.5	2	10.4	2
Filter blank	CR 341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR 331	13.1	6.7	2	6.2	2	5.1	2
Total particulate		92.3	19.0		19.7		15.5	

Remarks

Data reviewed by T.J.H.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS

PN 3530.15

Plant U.S. EPA - Mono Power — Run No. BDM5B

Sample location — Analyst C. Jones

Relative humidity 50% — Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BLK 5-10	5060A	316 ml's	103440.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR365	BDM5B	4157A	218 ml's	104355.8
Filter blank	CR341	BLANK	——	0002719	348.5
Filter	CR332	BDM5B	4157B	0002710	347.1

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR365	74.4	15.4	3	16.6	2	11.0	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR332	14.4	4.3	2	1.9	2	1.3	2
Total particulate		83.8	19.7		18.5		12.3	

Remarks

Data reviewed by T.J.A.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power — Run No. 9AM5B
Sample location — Analyst C. Jones
Relative humidity 50% — Density of acetone (pa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR 375	BLKS-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR366	9AM5B	4705A	286 ml's	106967.1
Filter blank	CR 341	BLANK	——	0002719	348.5
Filter	CR 333	9AM5B	4705B	0002711	347.0

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F — hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F — hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR366	45.9	——	——	——	——	13.5	2
Filter blank	CR 341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR 333	11.2	——	——	——	——	5.0	2
Total particulate		57.1	——		——		18.5	

Remarks
Data reviewed by T.J.W.

*Those are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power — Run No. 9BM5B
Sample location — Analyst C. Jones
Relative humidity 50% — Density of acetone (pa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BLK 5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR367	9BM5B	4708A	262 ml's	107863.2
Filter blank	CR341	BLANK	——	0002719	348.5
Filter	CR334	9BM5B	4708B	0002712	346.2

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F — hours — cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours — cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours — cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR367	47.1	——	——	18.2	2	14.0	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR334	11.1	——	——	7.2	2	6.5	2
Total particulate		58.2	——		25.4		20.5	

Remarks
Data reviewed by T.J.H.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - MONO Power — Run No. 9CMSB-P400
Sample location — Analyst C. JONES
Relative humidity 50% — Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BIK5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR368	9CMSB-Proc	4711A	208 ml's	106122.8
Filter blank	CR341	Blank	—	0002719	348.5
Filter	CR335	9CMSB P400	4711B	0002713	343.6

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F — hours — cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F — hours — cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours — cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR368	23.4	—	—	—	—	10.8	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR335	8.2	—	—	—	—	4.6	2
Total particulate		31.6	—		—		15.4	

Remarks
Data reviewed by T.J.N.

*These are net weights (gross wt. - avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530 15

Plant U.S. EPA - Mono Power — Run No. 9DM5B-P400
Sample location — Analyst C. Jones
Relative humidity 50% — Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BLK 5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR369	9DM5B-P400	4702A	287 ml's	106767.6
Filter blank	CR341	BLANK	—	0002719	348.5
Filter	CR336	9DM5B-P400	4703B	0002714	346.2

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F — hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR369	29.4	—	—	14.3	2	12.7	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR336	9.6	—	—	5.8	2	5.2	2
Total particulate		39.0	—		20.1		17.9	

Remarks
Data reviewed by T.G.R.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

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THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530 15

Plant U.S. EPA - Mono Power Run No. 10AMSB
Sample location Analyst C. Jones
Relative humidity 50% Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BIK 5-10	5060 A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR370	10AMSB	4730A	278 ml's	103555.4
Filter blank	CR341	BLANK	----	0002719	348.5
Filter	CR337	10AMSB	4730B	0002715	345.0

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 24 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR370	27.0	12.0	3	12.1	2	9.4	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR337	18.0	13.5	2	12.7	2	11.8	2
Total particulate		45.0	25.5		24.8		21.2	

Remarks "only two were required to meet ± 5.0 avg. 1-24-83 [illegible]"
Data reviewed by [illegible] T.J.V.

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530 15

Plant U.S. EPA - MONO POWER
Run No. 10BM5B
Sample location
Analyst C. JONES
Relative humidity 50%
Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BLK 5 10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR371	10BM5B	4733A	163 ml's	103452.6
Filter blank	CR341	Blank	——	0002719	348.5
Filter	CR338	10BM5B	4733B	0002716	346.8

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR371	20.9	13.4	2	10.4	2	8.0	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR338	17.6	14.3	2	11.9	2	11.2	2
Total particulate		38.5	27.7		22.3		19.2	

Remarks
Data reviewed by

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530.15

Plant U.S. EPA - MONO POWER Run No. 10CM5B

Sample location _____ Analyst C. JONES

Relative humidity 50% Density of acetone (ρa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BLK 5-10	5060A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR664	10CM5B	4736A	130 ml's	104925.4
Filter blank	CR341	BLANK	——	0002719	348.5
Filter	CR339	10CM5B	4736B	0002717	346.4

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F ~~24~~ hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F ~~24~~ hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F ~~24~~ hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR664	68.4	——	——	19.5	2	15.9	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR339	17.0	——	——	10.6	2	10.0	2
Total particulate		85.4	——		30.1		25.9	

Remarks _____

Data reviewed by _____ 1/12

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

THERMOGRAVIMETRIC PARTICULATE ANALYSIS
PN 3530-15

Plant U.S. EPA - Mono Power
Sample location
Relative humidity 50%

Run No. 10DMSB
Analyst C. Jones
Density of acetone (pa) .7908 (g/ml)

Sample type	Lab No.	Sample I.D.	Container No.	Initial Vol. (ml)	Tare Wt. (mg)
Acetone blank	CR375	BLK 5-10	5060 A	316 ml's	103410.0
Acetone blank (2)					
Acetone blank (3)					
Acetone rinse	CR372	10DMSB	4734A	156 ml's	107408.1
Filter blank	CR341	BLANK	—	0002719	348.5
Filter	CR340	10DMSB	4734B	0002718	346.8

Analysis results (mg)*

Sample type	Lab No.	Initial wt. (ambient)	Heat to 320°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 450°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight	Heat to 600°F 6 hours cool, weigh	Number of treatments required to achieve a stable weight
Acetone blank	CR375	2.8	1.9	2	1.4	2	0.8	2
Acetone blank (2)								
Acetone blank (3)								
Acetone rinse	CR372	59.3	—	—	16.8	2	11.8	2
Filter blank	CR341	0.2	-0.1	2	0.0	2	-0.1	2
Filter	CR340	18.0	—	—	12.6	2	10.8	2
Total particulate		77.3	—		29.4		22.6	

Remarks
Data reviewed by

*These are net weights (gross wt. avg. minus tare wt.) without blank subtraction.

LABORATORY REPORT

U.S. EPA PN 3530-14 1-7-83

Mono Power Samples
SO_2/H_2SO_4 Determinations

Run No.	PEDCo Lab Nos.	mg H_2SO_4	mg SO_2
1AM5B	CR 406/450	18.3	1910
1BM5B	CR 407/451	49.5	2020
1CM5BW	CR 408/452	107	1970
1DM5BW	CR 409/453	6.9	1990
2AM5B-P400	CR 410/454	33.9	1870
2BM5B-P400	CR 411/455	81.8	2310
2CM5B	CR 412/456	190	2260
2DM5B	CR 413/457	81.7	2370
3AM5BW	CR 414/458	78.5	4090
3BM5BW	CR 415/459	64.9	4080
3CM5B	CR 416/460	104	3970
3DM5B	CR 417/461	71.7	4080
4AM5B	CR 418/462	28.3	4350
4BM5B	CR 419/463	98.5	4360
4CM5B-P400	CR 420/464	107	4380
4DM5B-P400	CR 421/465	105	4340
5AM5B	CR 422/466	73.8	4540
5BM5B	CR 423/467	84.4	4420
5CM5B	CR 424/468	134	4420
5DM5B	CR 425/469	74.0	4400
6AM5B	CR 426/470	74.3	3950
6BM5B	CR 427/471	114	3910
6CM5BW	CR 428/472	44.9	3900
6DM5BW	CR 429/473	82.4	4050
7AM5B-P400	CR 430/474	110	4230
7BM5B-P400	CR 431/475	118	4240
7CM5B	CR 432/476	67.3	4070
7DM5B	CR 433/477	78.4	4210

Run No.	PEDCo Lab Nos.	mg H_2SO_4	mg SO_2
8AM5BW	CR 434/478	87.7	4070
8BM5BW	CR 435/479	120	330*
8CM5B	CR 436/480	58.6	3440
8DM5B	CR 437/481	62.6	3960
9AM5B	CR 438/482	87.8	4310
9BM5B	CR 439/483	101	4270
9CM5B-P400	CR 440/484	98.8	4170
9DM5B-P400	CR 441/485	85.6	4290
10AM5B	CR 442/486	92.0	4300
10BM5B	CR 443/487	104	4210
10CM5B	CR 444/488	75.8	4190
10DM5B	CR 445/489	58.6	4340
Blank 1, 2	CR 446/490	<0.1	<1
Blank 3, 4	CR 447/491	<0.1	<1
Blank 5, 6, 7	CR 448/492	<0.1	<1
Blank 8, 9, 10	CR 449/493	<0.1	<1

*This sample has been analyzed twice and gave the same results.

1-15-83 T.J.W.

LABORATORY REPORT

U.S. EPA PN: 3530-15 1-28-83

Mono Power
Nonwater Soluble Sulfate Particulate Analysis

Run No.	Lab No.	Net Weight, mg	C_{SO_4}, mg/l	Volume Evaporated* ml	NWSSP, mg
1CM5BW-F	CR386	9.4	24.20	235	1.6
1CM5BW-PR	CR395	43.4	79.75	308	9.6
1DM5BW-F	CR387	5.1	15.36	235	0.1
1DM5BW-PR	CR396	16.2	19.58	407	5.2
3AM5BW-F	CR388	6.9	14.58	235	2.2
3AM5BW-PR	CR397	56.0	45.18	550	21.8
3BM5BW-F	CR389	6.3	15.14	235	3.7
3BM5BW-PR	CR398	44.6	87.34	317	6.5
6CM5BW-F	CR390	10.7	21.70	235	3.7
6CM5BW-PR	CR399	87.9	163.5	325	14.8
6DM5BW-F	CR391	7.1	15.39	235	2.1
6DM5BW-PR	CR400	46.0	79.60	320	11.0
8AM5BW-F	CR392	10.2	22.12	235	3.0
8AM5BW-PR	CR401	32.1	42.35	242	18.0
8BM5BW-F	CR393	8.1	16.48	235	2.8
8BM5BW-PR	CR402	31.7	50.16	228	16.0
Blank-F	CR394	1.6	3.63	235	0.4
Blank-PR	CR403	1.7	0.29	403	1.5
Blank-F	CR497	(-0.2)	2.75	235	(-1.1)
Blank-PR	CR404	1.5	0.13	250	1.5
Blank-F	CR498	1.3	2.71	235	0.4
Blank-PR	CR405	0.7	0.30	360	0.6
Blank-F	CR499	2.6	2.81	235	1.7

*15 ml were removed for ion chromatography analysis.

Reviewed by: Thomas J. Wagner 2-2-83

LABORATORY REPORT
U.S. EPA; PN 3530-15
MARCH 8, 1983

MONO POWER SAMPLES

Run No.	Lab No.	C_{SO_4}, ml/liter	Volume, ml	Blank corrected SO_4, mg
1AM5B-PR	CR342	18.84	250	4.7
1AM5B-F	CR309	7.67	250	1.1
1BM5B-PR	CR343	13.35	250	3.3
1BM5B-F	CR310	16.93	250	3.4
2AM5B-P400-PR	CR344	10.02	250	2.5
2AM5B-P400-F	CR311	9.94	250	1.7
2BM5B-P400-PR	CR345	6.64	250	1.7
2BM5B-P400-F	CR312	10.53	250	1.8
2CM5B-PR	CR346	14.98	250	3.7
2CM5B-F	CR313	11.10	250	2.0
2DM5B-PR	CR347	7.62	250	1.9
2DM5B-F	CR314	10.26	250	1.8
3CM5B-PR	CR348	19.42	250	4.9
3CM5B-F	CR315	13.21	250	2.5
3DM5B-PR	CR349	31.94	250	8.0
3DM5B-F	CR316	11.50	250	2.1
4CM5B-P400-PR	CR352	12.12	250	3.0
4CM5B-P400-F	CR319	12.78	250	2.4
5AM5B-PR	CR354	16.33	250	4.1
5AM5B-F	CR321	11.32	250	2.0
6AM5B-PR	CR358	19.29	250	4.8
6AM5B-F	CR325	12.16	250	2.2
6BM5B-PR	CR359	10.01	250	2.5
6BM5B-F	CR326	14.16	250	2.7

(continued)

MONO POWER SAMPLES (continued)

Run No.	Lab No.	C_{SO_4}, ml/liter	Volume, ml	Blank corrected SO_4, mg
7DM5B-PR	CR363	31.77	250	7.9
7DM5B-F	CR330	14.31	250	2.8
8CM5B-PR	CR364	14.98	250	3.7
8CM5B-F	CR331	16.03	250	3.2
8DM5B-PR	CR365	19.00	250	4.8
8DM5B-F	CR332	12.20	250	2.3
9BM5B-PR	CR367	19.98	250	5.0
9BM5B-F	CR334	13.31	250	2.5
10CM5B-PR	CR664	25.19	250	6.3
10CM5B-F	CR339	18.43	250	3.8
Blank-PR	CR373	<1.00	250	<0.2
Blank-F	CR341	3.27	250	0.8

Reviewed by Thomas J Kaiser 3/9/83

APPENDIX D

SAMPLING AND ANALYTICAL PROCEDURES

SAMPLING AND ANALYTICAL PROCEDURES

A four-train (quad) sampling system was used in this test program. This system allowed four samples to be collected simultaneously at essentially the same point in the gas stream. Each individual sampling train consisted of a Method 5* fronthalf and a Method 8* backhalf. Method 5 sampling procedures were used for all tests, except as noted.

SAMPLING APPARATUS

The sampling train(s) used in these tests met design specifications established by the Federal EPA and was assembled by PEDCo personnel. Each train, set up as shown in Figure D-1, consisted of:

Nozzle - Stainless steel (316) with sharp, tapered leading edge and accurately measured round opening.

Probe - Borosilicate glass with a heating system capable of maintaining the desired gas temperature at the exit end during sampling.

Filter Holder - Pyrex glass with heating system capable of maintaining a filter temperature at desired levels.

Impingers - Five impingers connected in series with glass ball joints. The first, fourth, and fifth impingers were of the Greenburg-Smith design, modified by replacing the tip with a 1/2 inch I.D. glass tube extending to 1/2 inch from the bottom of the flask.

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*40 CFR 60, Appendix A, July 1981.

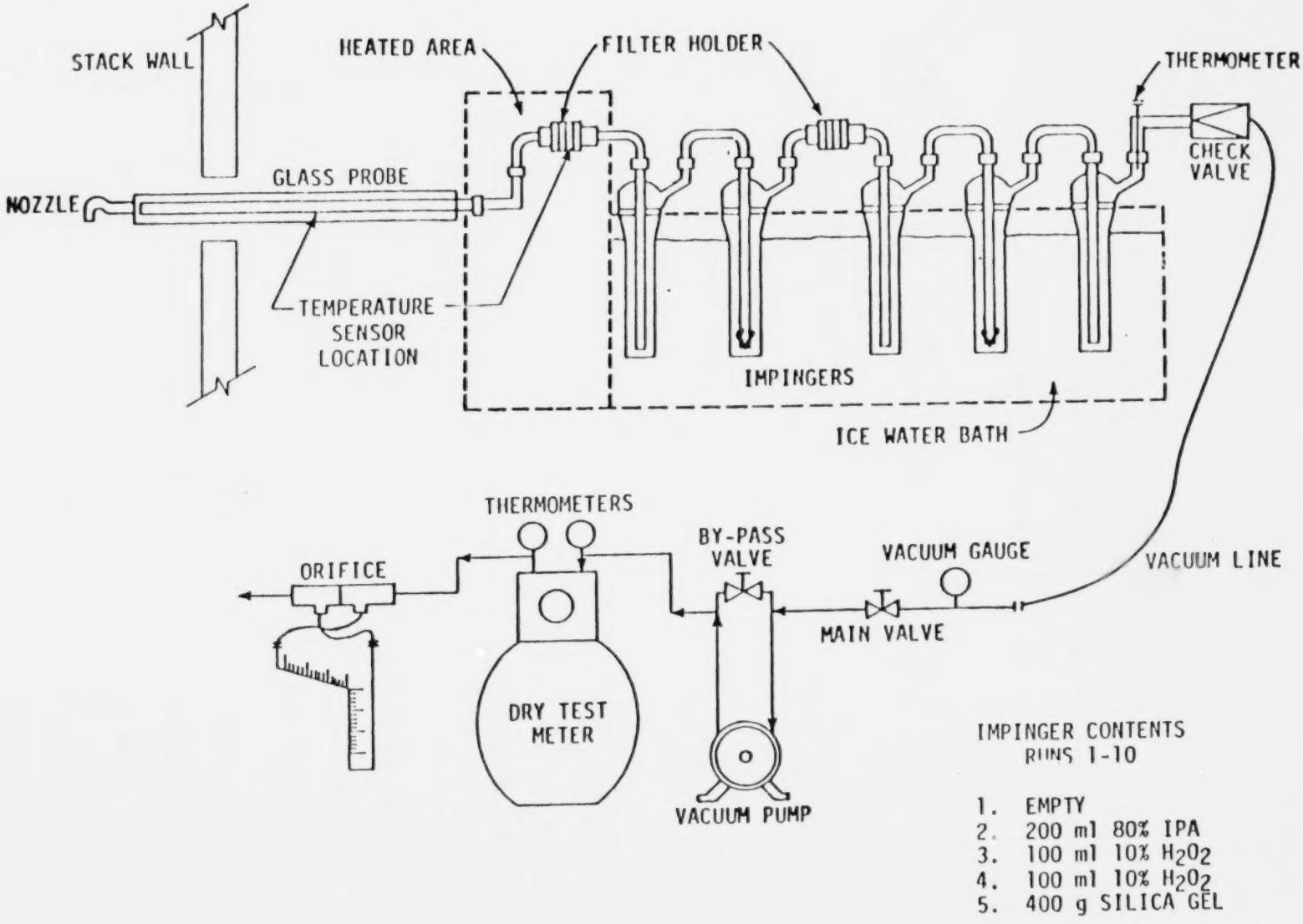

Figure D-1. Methods 5 and 8 sampling train schematic.

Back-Half Filter Holder - Unheated Pyrex glass inserted between the second and third impingers to prevent carryover of any sulfuric acid mist.

Metering System - Vacuum guage, leak-free pump, thermometers capable of measuring temperature to within 5°F, calibrated dry gas meter, and related equipment to maintain an isokinetic sampling rate and to determine sample volume.

A single pitot-tube and thermocouple located as shown in Figure D-2 were used to measure stack gas velocity. Equipment consisted of:

Pitot Tube - Type S pitot tube that met all geometry standards was attached to the probe system to monitor stack gas velocity pressure.

Temperature Gauge - A Chromel/Alumel Type-K thermocouple (or equivalent) was attached to the pitot tube, in an interference-free arrangement, to monitor stack gas temperature within 5°F by the use of a digital indicator.

Draft Gauge - An inclined manometer made by Dwyer with a readability of 0.01 inch H_2O in the 0 to 10 inch range was used.

Barometer - Aneroid type to measure atmospheric pressures to within ± 0.1 inch Hg.

Probe and filter temperatures were monitored using multi-terminal digital indicators with thermocouple leads located in the middle of each probe and immediately behind the Method 5 filter frits. Rheostat devices were used to control individual probe temperatures. Filter temperatures were maintained at the desired level by the use of individual temperature controllers.

SAMPLING PROCEDURE

After selecting the sampling site, the stack pressure, temperature, molecular weight, moisture content, and range of

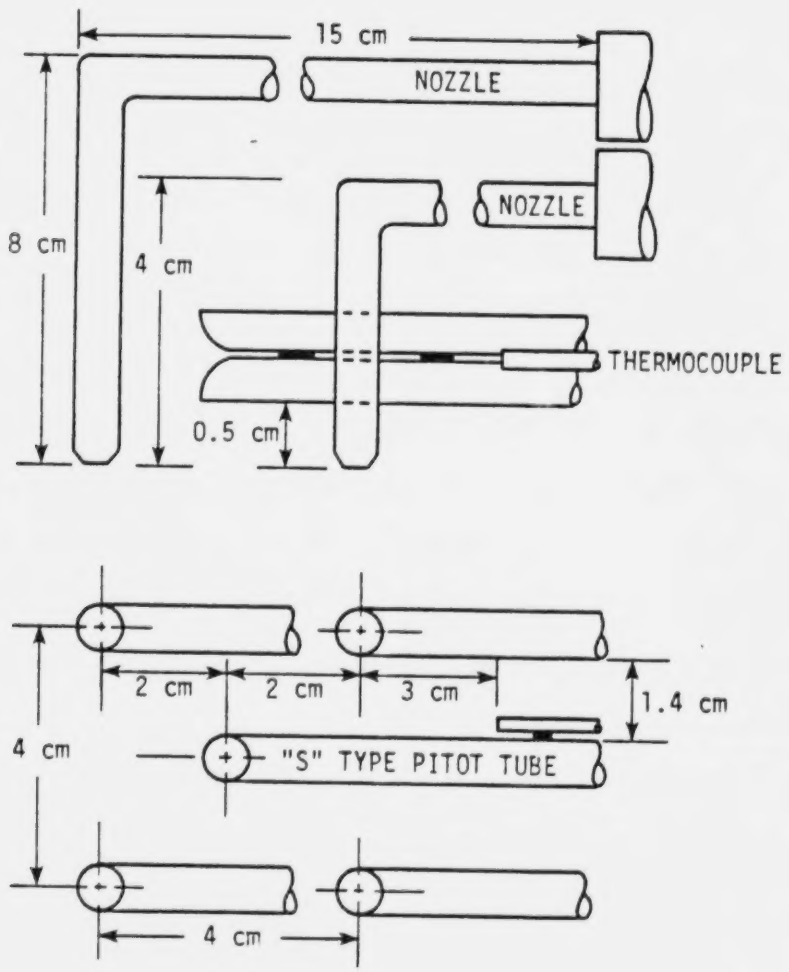

Figure D-2. Four-train sampling system showing nozzle, pitot tube, and thermocouple position.

velocity head in the general sampling area were measured according to procedures described in the Federal Register.* A single sampling point located approximately 1 meter from the stack wall was selected to allow all four nozzles to be positioned at points of equal velocity.

Individual sampling train components were assembled and labeled. Glass fiber filters** (3-in. diameter) used in the Method 5 position were heated to 315°C prior to identification and tare weighing to the nearest 0.1 mg on an analytical balance. Each sample train had a Method 8 backhalf, modified by adding a fifth impinger behind the filter to minimize evaporation loss of IPA by additional cooling of the hot sample gas prior to its contacting the IPA. An unheated glass fiber filter** assembly was inserted between the second and third impingers to preclude any sulfuric acid mist carryover. The contents of each impinger was as follows:

Impinger	Contents - All Runs
1	Empty
2	200-ml 80% IPA
3	100-ml 10% H_2O_2
4	100-ml 10% H_2O_2
5	400-grams silica gel

The sampling train subassemblies (probes, filter holders, impingers) were transported to the test site and assembled in the quad train configuration as shown in Figure D-3. The sampling trains were leak checked at the sampling site prior to each test

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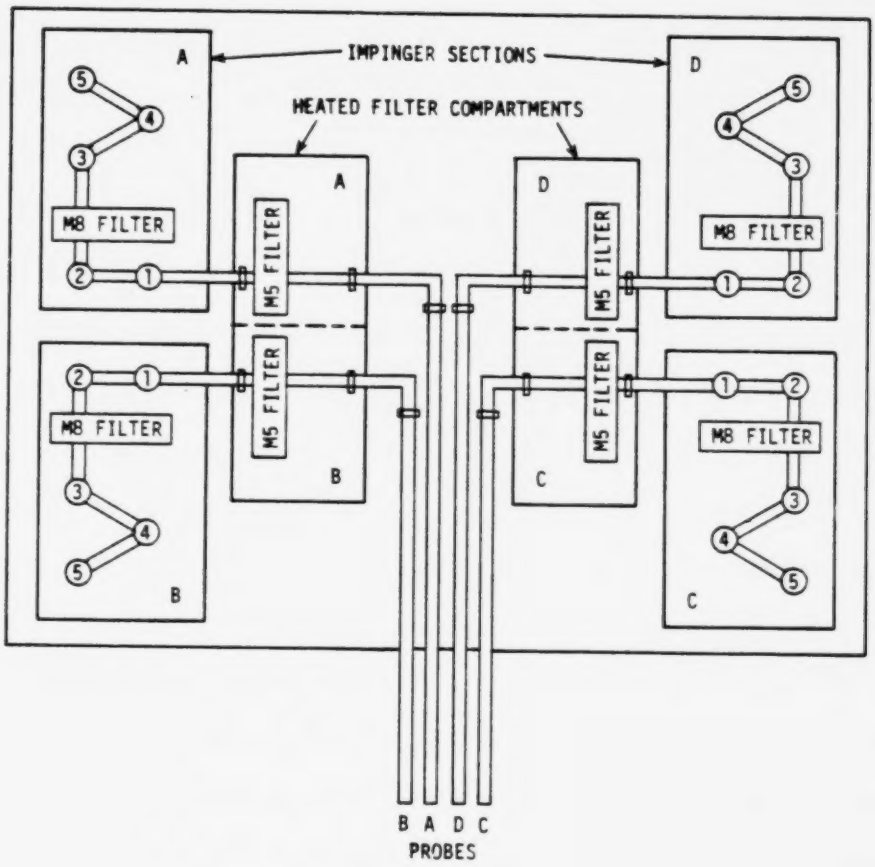
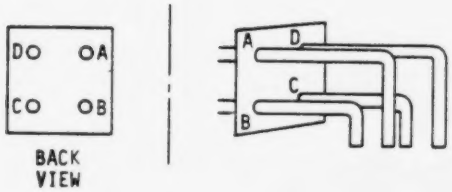
* 40 CFR 60, Appendix A, Reference Methods 2, 3, and 4, July 1, 1981.

** Whatman RA 934AH.



QUAD TRAIN ASSEMBLY



PROBE AND NOZZLE ORIENTATION

Figure D-3. Quad train configuration.

run by plugging the inlet to the nozzle and pulling a 15 inch Hg vacuum, and at the conclusion of the test by plugging the inlet to the nozzle and pulling a vacuum equal to the highest vacuum reached during the test run.

The pitot tube and lines were leak checked at the test site prior to each test run. The check was made by blowing into the impact opening of the pitot tube until 3 or more inches of water were recorded on the manometer and then capping the impact opening and holding it for 15 seconds to assure it was leak free. The static pressure side of the pitot tube was leak checked using the same procedure, except suction was used to obtain the 3 inch H_2O manometer reading. Crushed ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at 68°F or less. For each train, the probe and filter were preheated to the desired temperature prior to sampling and maintained at that temperature throughout the run. The particular conditions for each type of train were:

Method 5B (Designated M5B) - probe and filter assembly heated to 160°C (320°F).

Modified Method 5B (Designated M5B-P400) - probe heated to 204°C (400°F) to minimize cold spots and filter assembly heated to 160°C (320°F).

Method 5BW (Designated M5BW) - probe and filter assembly heated to 160°C (320°F).

During sampling, stack gas and sampling train data were recorded at 10-minute intervals and when significant changes in stack flow conditions occurred. Isokinetic sampling rates were

set throughout the sampling period with the aid of a programmable calculator. All sampling data were recorded on the Particulate Field Data Sheet.

SAMPLE RECOVERY

The components of the quad train sample system were labeled and disassembled at the stack for transport to the sample clean-up/setup area. The filter and probe assemblies were recovered as follows:

- All filters were carefully removed from the filter holder and placed in a petri dish. These filters were sealed and labeled for shipment.
- For Methods 5B and M5B-P400, loose particulate from all sample exposed surfaces prior to the filter and acetone washings were placed in a polyethylene container, sealed, and labeled. For Method 5BW, deionized, distilled water was used for the probe rinse. Particulate was removed from the nozzle and probe with a nylon brush. The liquid level was marked after each container was sealed.

The impinger section of each sample train (modified Method 8) was removed from its ice bath and purged with ambient air for 15 minutes before recovering the contents.

The contents were recovered as follows:

- After gravimetric weighing, the contents of the first and second impingers (condensate and 80 percent IPA) were placed in a polyethylene container. The impingers and connecting glassware prior to the backhalf filter were rinsed with 80 percent IPA and the rinse was added to the container along with the backhalf filter. The containers were then sealed, labeled, and the liquid level marked.
- After gravimetric weighing, the contents of the third and fourth impingers (10 percent H_2O_2) were placed in a polyethlyene container. The impingers and connecting glassware were rinsed with deionized, distilled water

and the rinse was added to the container. The containers were then sealed, labeled, and the liquid level marked.

- The color of the silica gel was noted on the sample recovery sheet and the net weight gain determined gravimetrically.

Blank samples were taken for each new batch (or a minimum of two) of the following reagents: acetone; deionized, distilled water; 80 percent IPA; 10 percent H_2O_2; and a filter. In addition, each probe was rinsed prior to initial use with either water or acetone (depending on method type), and these rinses were retained for probe rinse blank analysis.

SAMPLE LABELING

The sample label identifies the test run number, sample train, and each component of the individual train. The run numbers are consecutive from 1 to 10. Since each run consists of four single trains, each train was identified by a letter A, B, C, or D.

The last item of the label identifies the sample method and the component of the recovered sample. For example, identification No. 1A M5B-IPA indicates Test Run 1, Sample Train A, Method 5B sample method at 160°C (320°F) and the IPA impinger contents and rinse. Another example is 4C M5B-P400-Probe indicating Test Run 4, Sample Train C, Modified Method 5B sample method (filter at 160°C and probe at 204°C), and the probe rinse fraction.

SAMPLE RECEIPT AND CHAIN OF CUSTODY

Every sample entering the lab for analysis was assigned a unique alphanumeric identity on a Sample Receipt and Record Sheet

(log). In the sample log-in book, this number was correlated with sample identification label and with the number of the analysis requisition form. A copy of the analysis requisition was kept with the samples and later with the raw data.

The samples remained in a locked sample storage room until removed for analysis. Transfer was documented on a Sam, le Control Record which is maintained by the sample custodian. The Sample Control Record documents all custody changes which occur in the laboratory and each procedure performed on the sample.

Release of samples requires notation of the Sample Control Record and verification of information and sample container condition. If the sample is to be transferred between two persons (i.e., two analysts), the transfer must take place through the sample custodian. In other words, the sample will be returned to the sample custodian and reissued.

SAMPLE ANALYSIS

Particulate Analysis

Initially, the filter particulate catch was placed in a tared glass weighing dish, desiccated for 24 hours, and weighed to the nearest 0.1 mg until a constant weight was achieved. The probe rinse fraction was transferred to a tared beaker and evaporated to dryness at ambient temperature and pressure, desiccated for 24 hours, and weighed to the nearest 0.1 mg until a constant weight was achieved.

For the purpose of this study a constant weight was defined as a difference of no more than 0.5 mg or 1 percent of the net weight, whichever was greater, between successive weighings, with at least 6 hours of desiccation between weighings. This is the same definition as for Method 5. Because previous data have shown that samples containing a significant amount of sulfuric acid may not come to a constant weight, the following alternate procedure was used, if necessary: at least three separate weighings were obtained, and the lowest weight achieved was reported as the ambient weight.

After this initial gravimetric analysis at ambient conditions, probe rinse and filter fractions were subjected to the sequence of heat treatments as outlined in the analytical matrix (Table 3-2). The samples were heated in an oven at the specified temperature for either 6 or 24 hours as indicated. Each sample fraction was cooled and desiccated for 24 hours after removal from the oven and weighed to the nearest 0.1 mg.

Prior to advancing to the next step of an analytical sequence, a heat treatment was repeated at the same time and temperature condition until a stable weight was obtained. For the purpose of this study a stable weight was defined as a difference of no more than 5.0 mg or 10 percent of the net sample weight, whichever was greater, between successive treatments at the same conditions. The number of treatments required to achieve a stable weight was recorded for each sample fraction. A maximum of three treatments was performed at the same conditions.

Water-Soluble Sulfate Determination

Each sample fraction plus blanks were handled and analyzed as follows:

- Filter - The filter was cut into small pieces and placed in a 125-ml Erlenmeyer flask with a standard type joint equipped with an air condenser. The contents of the shipping container were rinsed into the flask. About 50 ml of distilled water was added and the contents gently refluxed for 6 to 8 hours. The solution was then cooled and diluted with water to exactly 250 ml in a volumetric flask. This solution was reserved for total soluble sulfate analysis, which is described below.

- Probe Rinse - The probe wash was poured into a 250 ml volumetric flask. The sample bottle was rinsed with distilled water and the rinsings were added to the flask. The solution was then diluted to the mark with distilled water (or, if greater than 250 ml, the volume was measured). This solution was reserved for total soluble sulfate analysis, which is described below.

Total Soluble Sulfate--

A 15-ml aliquot* was drawn from the settled samples (filter and rinse) into separate sample containers with a clean, dry pipet (only solution was transferred--no solid; if necessary, a portion of the sample was centrifuged). The sulfate ion ($SO_4^=$) concentration in each aliquot was determined by ion chromatography (IC). A syringe was used to inject 1 ml of the aliquot into the 100-µl sample loop of the IC flushing the loop with the sample. The conductivity response of the sample was compared with the calibration curve to obtain $SO_4^=$ concentration in mg/liter. Dilutions were prepared and reanalyzed if the initial

*The pipet is not rinsed. This deviation from normal procedures is necessary because the volume removed from the volumetric flask is required in the calculations.

response was out of the linear calibration range (i.e., greater than 15 mg/liter). Blank filter and water samples were prepared and analyzed in the same manner as the actual samples.

Mass Determination--

Filter and Rinse Solution Preparation - The remaining contents of each volumetric flask (235 ml) were poured into separate tared 250-ml beakers, and the flask was rinsed with distilled water to transfer all particulate matter. The filter solution was in Beaker A and the rinse solution was in Beaker B. These solutions were evaporated to approximately 100 ml at 105°C and allowed to cool before the next analysis was made.

Filter and Rinse Solution Analysis - Five drops of phenolphthalein indicator were added to all the tared beakers. Concentrated NH_4OH was then added drop by drop until the solution turned pink. The samples were returned to the oven and evaporated to dryness at 105°C, then cooled in a desiccator and weighed to a constant weight. Results were reported to the nearest 0.1 mg. For this method, "constant weight" means a difference of no more than 0.5 mg or 1 percent of the total weight less beaker and/or filter tare, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings.

Calculations--

Nomenclature--

FP = weight of particulate* on the filter in Beaker A, mg

PRP = weight of probe rinse particulate* in Beaker B, mg

NWSSP = weight of nonwater-soluble sulfate particulate**, mg

AS_f = weight of ammonium sulfate in filter sample, mg

AS_{pr} = weight of AS in probe rinse sample, mg

V_{evap} = volume of solution evaporated in Beaker A (filter) or Beaker B (probe rinse), ml

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*Particulate with H_2SO_4 converted to $(NH_4)_2SO_4$.

**Particulate excluding water-soluble sulfates.

C_{SO_4} = concentration of sulfate in filter or probe rinse solution aliquots, mg/liter

Equations--

$$FP(mg) = \text{gross weight Beaker A} - \text{tare weight Beaker A} - \text{filter tare weight} \quad \text{Eq. 1}$$

$$PRP(mg) = \text{gross weight Beaker B} - \text{tare weight Beaker B} \quad \text{Eq. 2}$$

$$AS(mg) = C_{SO_4}\ (mg/liter) \times V_{evap}\ (ml) \times \frac{liter}{1000\ ml} \times 1.376\ \left(\frac{mg\ AS}{mg\ SO_4}\right) \quad \text{Eq. 3}$$

Mass of Nonwater-Soluble Sulfate Particulate

The sum of the particulate* collected on the filter (FP) and the particulate* collected in the probe rinse (PRP) is equal to the sum of nonwater-soluble sulfate particulate (NWSSP) and ammonium sulfate (AS) in both samples:

$$FP + PRP = NWSSP + AS_f + AS_{pr} \quad \text{Eq. 4}$$

The NWSSP can be found by rearranging the equation and substituting appropriate values determined using Equations 1, 2, and 3.

$$NWSSP = FP + PRP - AS_f - AS_{pr} \quad \text{Eq. 5}$$

Sulfuric Acid Mist Analysis

The volume of the sample solution was recorded and the pH of the sample determined. The sample volume was diluted to 500 ml with 80 percent IPA. A 100 ml aliquot of this solution was pipetted into a 250 ml Erlenmeyer flask with 2 to 3 drops of

*Particulate with H_2SO_4 converted to $(NH_4)_2SO_4$.

thorin indicator and titrated to a pink end point using 0.0100 N barium perchlorate. If the end point color was not correct, the sample was passed through an ion exchange column and retitrated. A blank was titrated for each sample in the same manner.

Sulfur Dioxide Analysis

The sample was diluted to 500 ml with deionized, distilled water. A 20 ml aliquot of this solution was pipetted into a 250 Erlenmeyer flask with 80 ml of 100 percent IPA and 2 to 3 drops thorin indicator. The solution was then titrated to a pink end point using 0.0100 N barium perchlorate. A blank was titrated in the same manner.

APPENDIX E

CALIBRATION PROCEDURES AND RESULTS

CALIBRATION PROCEDURES AND RESULTS

All of the equipment used was calibrated according to the procedures outlined in Maintenance, Calibration, and Operation of Isokinetic Source-Sampling Equipment.*

NOZZLE DIAMETER

The nozzles were calibrated by making three separate measurements using different inside diameters and calculating the average. If a deviation of more than 0.004 inches was found the nozzle was either discarded or reamed out and remeasured. A micrometer was used for measuring. These calibration data are shown in Figures E-1a through c.

PITOT TUBE CALIBRATION

The pitot tubes used in sampling were constructed by PEDCo Environmental and met all requirements of Method 2, Section 4.1 of the Federal Register.** Therefore, a baseline coefficient of 0.84 was assigned to each pitot tube. See Figures E-2 and E-3 for alignment requirements of Method 2, and Figures E-4a and b for actual inspection data of the pitot tubes used during the test program.

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*Office of Air Programs Publication No. APTD-0576.

**40 CFR 60, Appendix A, Reference Method 2, July 1981.

Date 11/29/87 Calibrated by R. AUTESBERGER

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
2A → 1-06 (L)	.184	.181	.182	.003	.182
1A → 1-08 (L)	.185	.185	.185	.000	.185
2E → 1-02 (S)	.177	.178	.177	.001	.177
2C → 1-01 (S)	.180	.181	.180	.001	.180
1D → 1-09 (L)	.183	.185	.185	.002	.185
2D → 1-04 (L)	.182	.182	.180	.002	.182
1B → 1-11 (S)	.185	.186	.187	.001	.186
1C → 1-12 (S)	.188	.188	.188	.000	.188

where:

$D_{1,2,3,}$ = nozzle diameter measured on a different diameter, in. Tolerance = measure within 0.001 in.

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

D_{avg} = average of D_1, D_2, and D_3.

Figure E-1a. Nozzle calibration data.

Date 11/30/82 Calibrated by R. AUTENBERGER

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
3C-2-09	.221	.220	.219	.002	.220
3B-2-10	.222	.221	.221	.001	.221
3A-2-11	.221	.222	.222	.001	.222
3D-2-12	.220	.220	.219	.001	.220

where:

$D_{1,2,3,}$ = nozzle diameter measured on a different diameter, in. Tolerance = measure within 0.001 in.

ΔD = maximum difference in any two measurements, in. Tolerance = 0.004 in.

D_{avg} = average of D_1, D_2, and D_3.

Figure E-1b. Nozzle calibration data.

Date 11/30/82 Calibrated by R. Autesberger

Nozzle identification number	D_1, in.	D_2, in.	D_3, in.	ΔD, in.	D_{avg}
4-B-2-01	.219	.220	.220	.001	.220
4-C-2-02	.220	.219	.219	.001	.219
4D-2-07	.220	.221	.221	.001	.221
4A-2-03	.219	.220	.219	.001	.219

where:

$D_{1,2,3,}$ = nozzle diameter measured on a different diameter, in.
Tolerance = measure within 0.001 in.

ΔD = maximum difference in any two measurements, in.
Tolerance = 0.004 in.

D_{avg} = average of D_1, D_2, and D_3.

Figure E-1c. Nozzle calibration data.

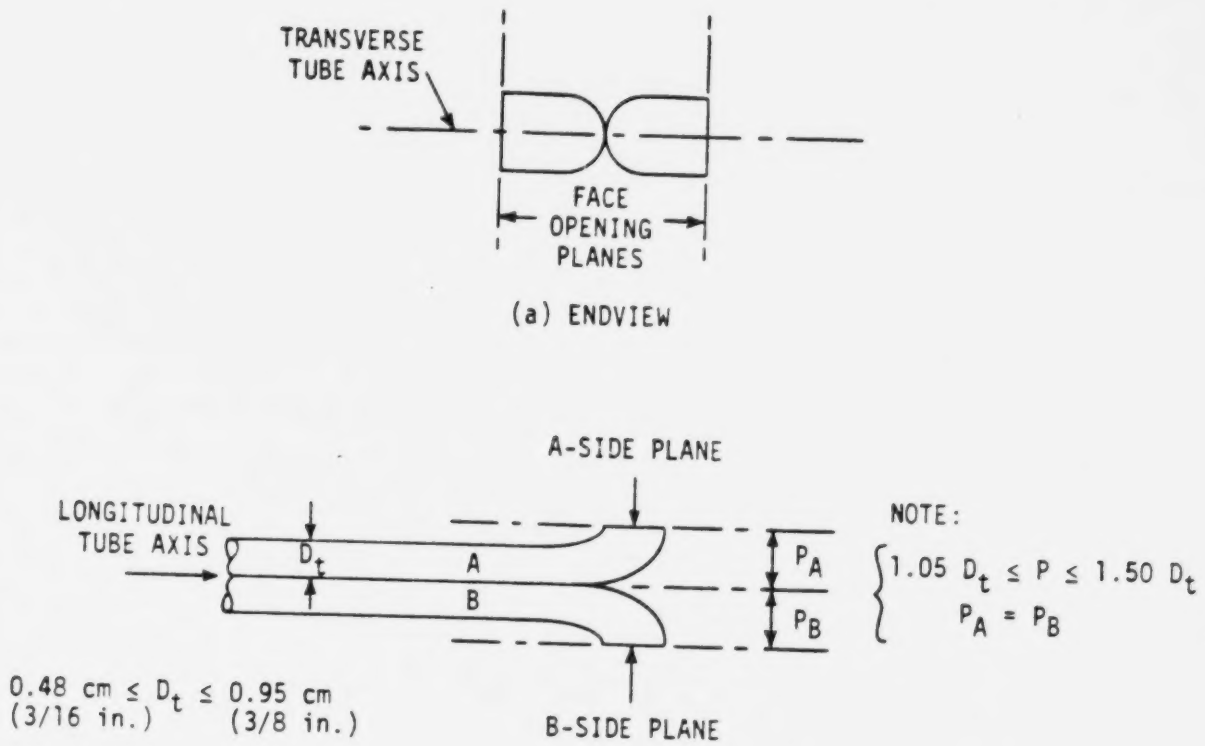

Figure E-2. Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

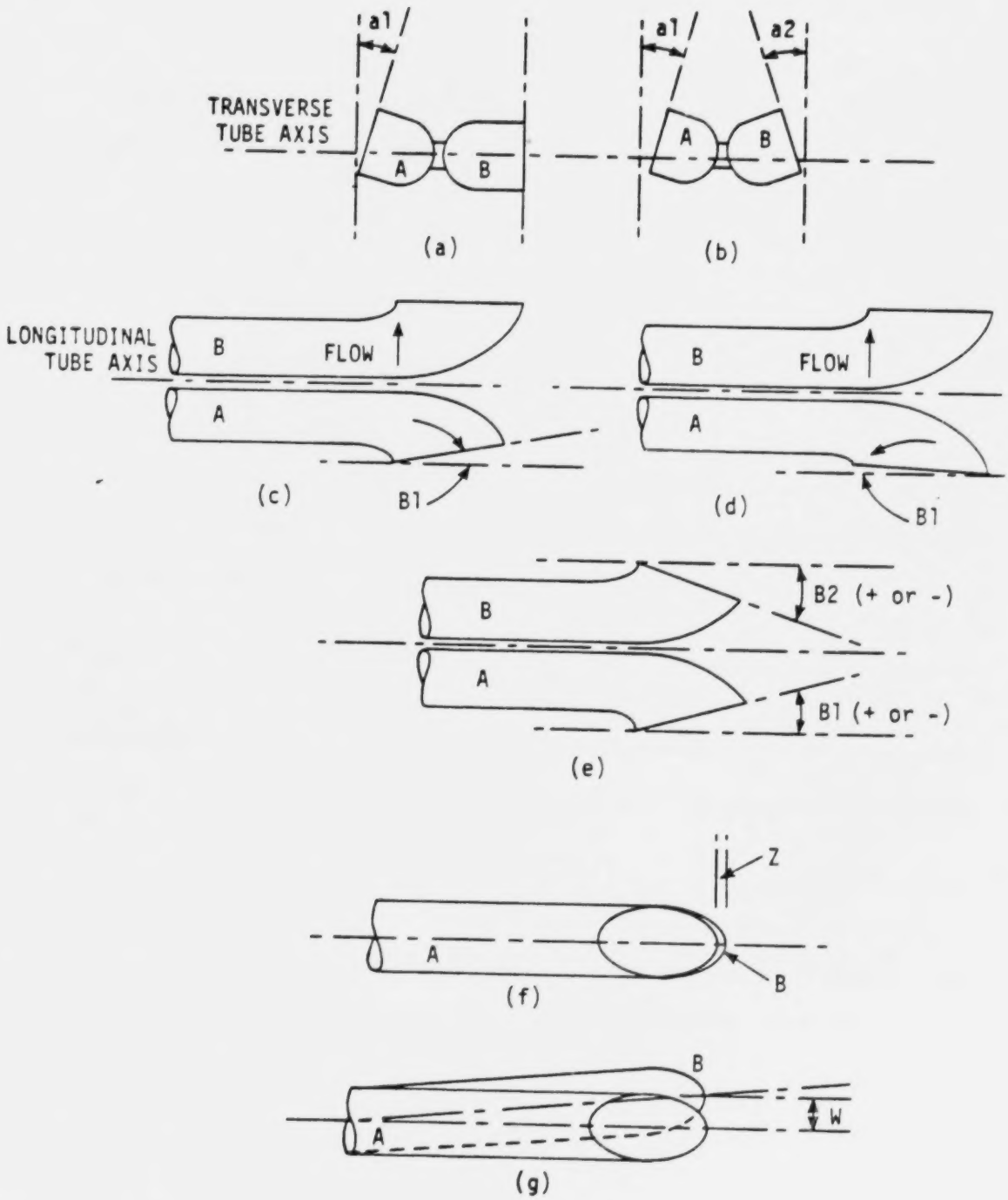

Figure E-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect Cp so long as a_1 and a_2 <10°, B_1 and B_2 <5°, z <0.32 (1/8 in.) and w <0.08 cm (1/32 in.).

Pitot Tube No. 183 Date 11/4/82 Inspector Fauglaug

α_1 Degrees	α_2 Degrees	β_1 Degrees	β_2 Degrees
4°	5°	2°	3°
<10°	<10°	<5°	<5°

D_t Inches	P Inches	1.05 D_t Inches	1.50 D_t Inches
.375	.981	.394	.563
0.185 ≤ P_t <0.380	-	-	-

γ Degrees	ϕ Degrees	P_{sin} (γ) Inches	P_{sin} (ϕ) Inches
6°	1°	.102	.017
-	-	<0.125	<0.03125

P_1 Inches	P_2 Inches	$\lvert P_1 - P_2 \rvert$ Inches	Meet specifications
.470	.475	.005	
1.05 D_t <P_1 <1.50 D_t	1.05 D_t <P_2 <1.50 D_t	≤0.010	✓

Lower line in each table is limits for meeting specifications.

Figure E-4a. Pitot tube inspection data sheet.

Pitot Tube No. #401 Date 12/8/82 Inspector E. ANTESBERGER

α_1 Degrees	α_2 Degrees	β_1 Degrees	β_2 Degrees
4°	1°	1°	4°
<10°	<10°	<5°	<5°

D_t Inches	P Inches	1.05 D_t Inches	1.50 D_t Inches
.377	.950	.395	.565
$0.185 \leq P_t < 0.380$	-	-	-

γ Degrees	ϕ Degrees	P_{sin} (γ) Inches	P_{sin} (ϕ) Inches
2.0°	2.0°	.0348	.03481
-	-	<0.125	<0.03125

P_1 Inches	P_2 Inches	$\lvert P_1 - P_2 \rvert$ Inches	Meet specifications
.476	.474	.002	Yes
1.05 D_t <P_1 <1.50 D_t	1.05 D_t <P_2 <1.50 D_t	$\leq$0.010	

Lower line in each table is limits for meeting specifications.

Figure E-4b. Pitot tube inspection data sheet.

DRY GAS METER AND ORIFICE METER

Figure E-5 was the set-up used for the initial and post-test calibration. A wet test meter with a 2-cubic-feet-per-minute capacity and ±1 percent accuracy was used. The pump was run for approximately 15 minutes at an orifice manometer setting of 0.5 inch of water to heat up the pump and wet the interior surface of the wet test meter. The information on Figure E-6 (example calculation sheet) was gathered for the initial calibration and then, the ratio of accuracy of the wet test meter to the dry test meter, and the ΔH@ were calculated.

POST-TEST METER CALIBRATION CHECK

A post-test meter calibration check was made on the meter box used during the test to check its accuracy against its last calibration check. This post-test calibration must be within ±5 percent of the initial calibration. The initial calibration was performed as described in APTD-0576. The post-test calibration was performed using the same method as the initial calibration. Three calibration runs were made using the average orifice setting obtained during each test run and with the vacuum set at the average value obtained during each test run. After running the post-test calibration check all three runs were within the ±5 percent range allowed by the Federal Register.*

The initial and post-test meter box calibration data are presented in Figures E-7a through h.

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*40 CFR 60, Appendix A, Reference Method 2, July 1981.

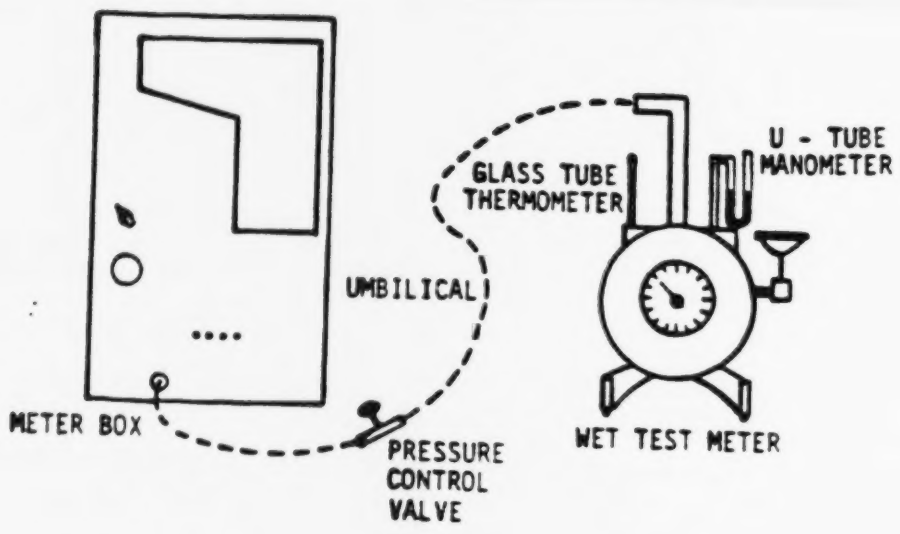

Figure E-5. Calibration setup.

DATE _____ METER BOX NO. _____

BAROMETRIC PRESSURE, P_b = _____ in. Hg. DRY GAS METER NO. _____

Orifice manometer setting ΔH in. H_2O	Gas volume wet test meter V_w, ft_3	Gas volume dry gas meter V_d, ft_3	Wet test meter t_w, °F	Dry gas meter Inlet t_{di}, °F	Dry gas meter Outlet t_{do}, °F	Dry gas meter Average t_d, °F	Time θ, min	Y	$\Delta H@$
0.5	5								
1.0	5								
1.5	10								
2.0	10								
3.0	10								
4.0	10								

Average _____

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H@$: $\frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w} \right]^2$
0.5	0.0368		
1.0	0.0737		
1.5	0.110		
2.0	0.147		
3.0	0.221		
6.0	0.294		

Y = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

$\Delta H@$ = Orifice of pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in H_2). Tolerance = ±0.15.

Figure E-6. Calibration data sheet.

DATE: 3/10/82 METER BOX NO. FB-3

CALIBRATOR: Bruce Armstrong BAROMETRIC PRESSURE (P_b) 29.630 in. Hg

Leak Checks:

Positive (minimum 5 in. H_2O): ✓

Negative (within 3 in. Hg of absolute): 0.000 cfm* 27.0 in. Hg

*Not to exceed 0.005 cfm.

Orifice manometer setting ΔH in H_2O	Volume wet test meter V_w ft^3	Volume dry gas meter V_d ft^3	Temperatures: Wet test meter T_w °F	Temperatures: Dry gas meter Inlet T_i °F	Temperatures: Dry gas meter Outlet T_o °F	Temperatures: Dry gas meter Average T_d °F	Duration of test θ min	Vacuum setting in Hg	Y	ΔH@ in H_2O
0.5	11.000	535.000	71.5	78	72	76.5	25 40/60	13.0	1.004	1.91
		546.044	71.5	84	72					
1.0	10.000	546.400	71.5	88	72	79.5	18 04.9/60	13.0	1.003	1.97
		556.492	71.5	87	75					
1.5	10.000	556.800	71.5	87	75	81.8	15 31.3/60	12.0	1.006	2.02
		566.897	71.5	90	75					
2.0	13.000	567.200	71.5	90	75	83.5	17 22.5/60	11.0	1.008	2.03
		580.320	71.5	93	76					
3.0	10.000	580.700	71.5	93	76	84.9	11 00.2/60	10.0	1.008	2.01
		590.796	71.5	94	76					
4.0	17.000	592.200	71.5	94	76	87.0	16 22.5/60	10.0	1.009	2.05
		609.476	71.5	100	78					
								Average	1.006	2.00

Y must not deviate by more than ±0.02 Y.

ΔH@ must not deviate by more than 0.15 in H_2O.

ΔH	Y: $\frac{(V_w)(P_b)(T_d + 460)}{(V_d)(P_b + \Delta H/13.6)(T_w + 460)}$	ΔH@: $\frac{(0.0317)(\Delta H)}{(P_b)(T_d + 460)}\left[\frac{(T_w + 460)(\theta)}{(V_w)}\right]^2$
0.5	$\frac{(11.000)(29.630)(536.5)}{(11.044)(29.667)(531.5)}$	$\frac{(0.0317)(0.5)}{(29.630)(536.5)}\left[\frac{(531.5)(28.667)}{(11.000)}\right]^2$
1.0	$\frac{(10.000)(29.630)(539.5)}{(10.092)(29.704)(531.5)}$	$\frac{(0.0317)(1.0)}{(29.630)(539.5)}\left[\frac{(531.5)(18.748)}{(10.000)}\right]^2$
1.5	$\frac{(10.000)(29.630)(541.8)}{(10.097)(29.740)(531.5)}$	$\frac{(0.0317)(1.5)}{(29.630)(541.8)}\left[\frac{(531.5)(15.522)}{(10.000)}\right]^2$
2.0	$\frac{(13.000)(29.630)(543.5)}{(13.120)(29.727)(531.5)}$	$\frac{(0.0317)(2.0)}{(29.630)(543.5)}\left[\frac{(531.5)(17.542)}{(13.000)}\right]^2$
3.0	$\frac{(10.000)(29.630)(544.8)}{(10.046)(29.855)(531.5)}$	$\frac{(0.0317)(3.0)}{(29.630)(544.8)}\left[\frac{(531.5)(11.003)}{(10.000)}\right]^2$
4.0	$\frac{(17.000)(29.630)(547.0)}{(17.176)(29.924)(531.5)}$	$\frac{(0.0317)(4.0)}{(29.630)(547.0)}\left[\frac{(531.5)(6.342)}{(17.000)}\right]^2$

Figure E-7a. Particulate sampling meter box initial calibration.

DATE: 12/6/82 METER BOX NO. FB-3

BAROMETRIC PRESSURE (P_{bar}): 29.48 in. Hg PRETEST Y: 1.006 ΔH@: 2.00

PLANT: MONO POWER/PLEASANTS STA. PROJECT NO. 3530-15

PROJECT MANAGER J. PROHASKA CALIBRATOR: Z. ANTESBERGER

Orifice manometer setting * ΔH in. H_2O	Wet test meter volume V_w ft^3	Dry gas meter volume V_d ft^3	Temperatures: Wet test meter T_w °F	Dry gas meter: Inlet T_{di} °F	Dry gas meter: Outlet T_{di} °F	Dry gas meter: Average T_d °F	Vacuum setting ** in. Hg	Duration of run Ø min	Y	ΔH@
		346.915	74	75	68					
3.0	11	358.015	74	77	70	72.5	10	11.97	.980	2.05
		358.015	74	77	70					
3.0	10	368.118	74	82	70	74.75	10	10.95	.983	2.06
		368.118	74	82	70					
3.0	16	384.310	74	88	73	78.25	10	17.67	.988	2.08
							Post-test average***		.9836	2.06

Y	ΔH@
$\frac{(V_w)(P_{bar})(T_d + 460)}{(V_d)(P_{bar} + \Delta H/13.6)(T_w + 460)}$	$\frac{(0.0317)(\Delta H)}{(P_{bar})(T_d + 460)}\left[\frac{(T_w + 460)(\text{Ø})}{(V_w)}\right]^2$
$\frac{(11.000)(29.48)(532.5)}{(11.100)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(532.5)}\left[\frac{(534.5)(11.97)}{(11.000)}\right]^2$
$\frac{(10.000)(29.48)(534.75)}{(10.103)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(534.75)}\left[\frac{(534.5)(10.95)}{(10.000)}\right]^2$
$\frac{(16.000)(29.48)(538.25)}{(16.192)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(538.25)}\left[\frac{(534.5)(17.67)}{(16.000)}\right]^2$

*To be the average ΔH used during the test series.
**To be the highest vacuum used during the test series.
***Post-test Y must be within the range, pre-test Y ±0.05Y
Post-test ΔH@ must be within the range, pre-test ΔH@ ±0.15

Figure E-7b. Particulate sampling meter box post-test calibration.

DATE: 3/12/82 METER BOX NO. FB-4

CALIBRATOR: B. Armstrong BAROMETRIC PRESSURE (P_b) 29.650 in. Hg

Leak Checks:

Positive (minimum 5 in. H_2O): ✓

Negative (within 3 in. Hg of absolute): 0.001 cfm* 27.2 in. Hg

*Not to exceed 0.005 cfm.

Orifice manometer setting ΔH in H_2O	Volume wet test meter V_w ft^3	Volume dry gas meter V_d ft^3	Temperatures: Wet test meter T_w °F	Dry gas meter: Inlet T_i °F	Dry gas meter: Outlet T_o °F	Dry gas meter: Average T_d °F	Duration of test θ min	Vacuum setting in Hg	Y	ΔH@ in H_2O
0.5	14.000	62.700	71.0	88	78	82.8	35 48/60	10.0	1.042	1.82
		76.415	71.0	88	77					
1.0	13.000	49.300	71.0	88	78	83.0	23 15.5/60	13.0	1.038	1.78
		62.080	71.0	88	78					
1.5	13.000	25.900	71.0	88	78	83.0	19 33.7/60	9.5	1.036	1.89
		38.682	71.0	88	78					
2.0	13.000	13.000	71.0	88	77	82.8	17 00.5/60	10.0	1.037	1.90
		25.750	71.0	88	78					
3.0	13.000	98.900	71.0	87	76	81.8	14 2.0/60	10.0	1.033	1.95
		11.640	71.0	87	77					
4.0	13.000	85.604	71.0	86	76	81.3	11 58.8/60	11.0	1.033	1.89
		98.308	71.0	87	76					
								Average	1.037	1.87

Y must not deviate by more than ±0.02 Y.

ΔH@ must not deviate by more than 0.15 in H_2O.

ΔH	Y: $\frac{(V_w)(P_b)(T_d + 460)}{(V_d)(P_b + \Delta H/13.6)(T_w + 460)}$	ΔH@: $\frac{(0.0317)(\Delta H)}{(P_b)(T_d + 460)}\left[\frac{(T_w + 460)(\theta)}{(V_w)}\right]^2$
0.5	(14.000)(29.650)(542.8) / (13.715)(29.683)(491.0)	(0.0317)(0.5) / (29.650)(542.8) [(531.0)(35.800) / (14.000)]^2
1.0	(13.000)(29.650)(543.0) / (12.780)(29.724)(531.0)	(0.0317)(1.0) / (29.650)(543.0) [(531.0)(23.258) / (13.000)]^2
1.5	(13.000)(29.650)(542.0) / (12.782)(29.760)(531.0)	(0.0317)(1.5) / (29.650)(542.8) [(531.0)(19.562) / (13.000)]^2
2.0	(13.000)(29.650)(542.8) / (12.750)(29.797)(531.0)	(0.0317)(2.0) / (29.650)(542.8) [(531.0)(17.015) / (13.000)]^2
3.0	(13.000)(29.650)(541.8) / (12.740)(29.871)(531.0)	(0.0317)(3.0) / (29.650)(541.8) [(531.0)(14.834) / (13.000)]^2
4.0	(13.000)(29.650)(541.3) / (12.754)(29.944)(531.0)	(0.0317)(4.0) / (29.650)(541.3) [(531.0)(11.967) / (13.000)]^2

Figure E-7c. Particulate sampling meter box initial calibration.

DATE: 12/6/82 METER BOX NO. PB-4

BAROMETRIC PRESSURE (P_{bar}): 29.48 in. Hg PRETEST Y: 1.037 ΔH@: 1.87

PLANT: MONO POWER/PLEASANTS STA. PROJECT NO. 3530-15

PROJECT MANAGER: J. PODHASKA CALIBRATOR: R. ANTESBERGER

Orifice manometer setting * ΔH in. H_2O	Wet test meter volume V_w ft^3	Dry gas meter volume V_d ft^3	Temperatures: Wet test meter T_w °F	Temperatures: Dry gas meter Inlet T_{di} °F	Temperatures: Dry gas meter Outlet T_{do} °F	Temperatures: Dry gas meter Average T_d °F	Vacuum setting ** in. Hg	Duration of run Ø min	Y	ΔH@
3.0	12	350.456	74.5	78	74					
		362.150	74.5	82	76	77.5	10	12.72	1.024	1.92
3.0	10	362.150	74.5	82	76					
		371.933	74.5	85	77	80	10	10.60	1.025	1.93
3.0	10	371.933	74.5	85	77					
		381.722	74.5	87	78	82.75	10	10.64	1.027	1.925
						Post-test average***			1.025	1.925

Y	ΔH@
$\frac{(V_w)(P_{bar})(T_d + 460)}{(V_d)(P_{bar} + \Delta H/13.6)(T_w + 460)}$	$\frac{(0.0317)(\Delta H)}{(P_{bar})(T_d + 460)}\left[\frac{(T_w + 460)(\text{Ø})}{(V_w)}\right]^2$
$\frac{(12.000)(29.48)(537.5)}{(11.694)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(537.5)}\left[\frac{(534.5)(12.72)}{(12.000)}\right]^2$
$\frac{(10.000)(29.48)(540)}{(9.783)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(534.5)}\left[\frac{(534.5)(10.60)}{(10.000)}\right]^2$
$\frac{(10.000)(29.48)(541.75)}{(9.789)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(541.75)}\left[\frac{(534.5)(10.64)}{(10.000)}\right]^2$

*To be the average ΔH used during the test series.
**To be the highest vacuum used during the test series.
***Post-test Y must be within the range, pre-test Y ±0.05Y
Post-test ΔH@ must be within the range, pre-test ΔH@ ±0.15

Figure E-7d. Particulate sampling meter box post-test calibration.

DATE: MARCH 4, 1982

CALIBRATOR: Daniel E. Fitzgerald

METER BOX NO. FB#5

BAROMETRIC PRESSURE (P_b) 29.10 in. Hg

Leak Checks:

Positive (minimum 5 in. H_2O): Eff

Negative (within 3 in. Hg of absolute): 0.000 cfm* 28.5 in. Hg

*Not to exceed 0.005 cfm.

Orifice manometer setting ΔH in H_2O	Volume wet test meter V_w ft^3	Volume dry gas meter V_d ft^3	Temperatures: Wet test meter T_w °F	Dry gas meter: Inlet T_i °F	Dry gas meter: Outlet T_o °F	Dry gas meter: Average T_d °F	Duration of test θ min	Vacuum setting in Hg	Y	ΔH@ in H_2O
0.5	5.0	245.761	70.5	90	82	86.25	13 24.0/60	7.5	.9899	2.016
		250.955	70.5	91	82					
1.0	5.0	251.319	70.5	90	82	86.75	7 25.3/60	10.0	.9887	1.990
		256.524	70.5	92	83					
1.5	10.0	256.797	70.5	92	83	88.5	15 5.9/60	10.0	.9879	1.912
		267.233	70.5	95	84					
2.0	10.0	267.488	70.5	95	84	90.0	13 5.0/60	10.0	.9873	1.907
		277.535	70.5	97	84					
3.0	10.0	278.332	70.5	96	85	91.0	10 47.3/60	10.0	.9873	1.943
		288.773	70.5	95	85					
4.0	10.0	289.333	70.5	97	85	91.25	9 22.6/60	10.0	.9859	1.957
		299.769	70.5	98	85					

Y must not deviate by more than ±0.02 Y.
ΔH@ must not deviate by more than 0.15 in H_2O.

Average: 0.988, 1.95

ΔH	Y: $\frac{(V_w)(P_b)(T_d + 460)}{(V_d)(P_b + \Delta H/13.6)(T_w + 460)}$	ΔH@: $\frac{(0.0317)(\Delta H)}{(P_b)(T_d + 460)}\left[\frac{(T_w + 460)(\theta)}{(V_w)}\right]^2$
0.5	$\frac{(5.0)(29.10)(546.25)}{(5.194)(29.14)(530.5)}$	$\frac{(.0317)(.5)}{(29.1)(546.25)}\left[\frac{(530.5)(13.4)}{5}\right]^2$
1.0	$\frac{(5.0)(29.10)(546.75)}{(5.202)(29.17)(530.5)}$	$\frac{(.0317)(1.0)}{(29.1)(546.75)}\left[\frac{(530.5)(9.42)}{5}\right]^2$
1.5	$\frac{(10.0)(29.10)(548.5)}{(10.426)(29.21)(530.5)}$	$\frac{(.0317)(1.5)}{(29.1)(548.5)}\left[\frac{(530.5)(15.1)}{10}\right]^2$
2.0	$\frac{(10.0)(29.10)(550.0)}{(10.447)(29.25)(530.5)}$	$\frac{(.0317)(2.0)}{(29.1)(550.0)}\left[\frac{(530.5)(13.04)}{10}\right]^2$
3.0	$\frac{(10.0)(29.10)(551.0)}{(10.441)(29.32)(530.5)}$	$\frac{(.0317)(3.0)}{(29.1)(551.0)}\left[\frac{(530.5)(10.75)}{10}\right]^2$
4.0	$\frac{(10.0)(29.10)(551.25)}{(10.436)(29.39)(530.5)}$	$\frac{(.0317)(4.0)}{(29.1)(551.25)}\left[\frac{(530.5)(9.35)}{10}\right]^2$

Figure E-7e. Particulate sampling meter box initial calibration.

DATE: 12/6/87 — METER BOX NO. F8-5

BAROMETRIC PRESSURE (P_{bar}): 29.48 in. Hg — PRETEST Y: .988 ΔH@: 1.95

PLANT: MONO POWER/PLEASANTS STA — PROJECT NO. 3530-15

PROJECT MANAGER: J. PROHASKA — CALIBRATOR: R. ANTESBERGER

Orifice manometer setting * ΔH in. H_2O	Wet test meter volume V_w ft^3	Dry gas meter volume V_d ft^3	Temperatures: Wet test meter T_w °F	Dry gas meter: Inlet T_{di} °F	Dry gas meter: Outlet T_{di} °F	Dry gas meter: Average T_d °F	Vacuum setting ** in. Hg	Duration of run θ min	Y	ΔH@
		094.080	74.5	80	70					
3.0	11	105.137	74.5	86	74	77.5	10	11.35	.990	1.825
		105.137	74.5	86	74					
3.0	10	115.290	74.5	91	76	81.75	10	10.31	.991	1.81
		115.290	74.5	91	76					
3.0	11	126.525	74.5	94	78	84.75	10	11.47	.990	1.84
								Post-test average***	.990	1.825

Y	ΔH@
$\frac{(V_w)(P_{bar})(T_d + 460)}{(V_d)(P_{bar} + \Delta H/13.6)(T_w + 460)}$	$\frac{(0.0317)(\Delta H)}{(P_{bar})(T_d + 460)}\left[\frac{(T_w + 460)(\theta)}{(V_w)}\right]^2$
$\frac{(11.000)(29.48)(537.5)}{(11.087)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(537.5)}\left[\frac{(534.5)(11.35)}{(11.000)}\right]^2$
$\frac{(10.000)(29.48)(541.75)}{(10.153)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(541.75)}\left[\frac{(534.5)(10.31)}{(10.000)}\right]^2$
$\frac{(11.000)(29.48)(544.75)}{(11.235)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(544.75)}\left[\frac{(534.5)(11.47)}{(11.000)}\right]^2$

*To be the average ΔH used during the test series.
**To be the highest vacuum used during the test series.
***Post-test Y must be within the range, pre-test Y ±0.05Y
Post-test ΔH@ must be within the range, pre-test $\overline{\Delta H@}$ ±0.15

Figure E-7f. Particulate sampling meter box post-test calibration.

DATE: 1/15/82 METER BOX NO. FB-8

CALIBRATOR: Bruce Armstrong BAROMETRIC PRESSURE (P_b) 29.440 in. Hg

Leak Checks:

Positive (minimum 5 in. H_2O): ✓ 13A

Negative (within 3 in. Hg of absolute): 0.000 cfm* ~~29.440~~ 27.0 in. Hg

*Not to exceed 0.005 cfm.

Orifice manometer setting ΔH in H_2O	Volume wet test meter V_w ft^3	Volume dry gas meter V_d ft^3	Temperatures: Wet test meter T_w °F	Dry gas meter: Inlet T_i °F	Dry gas meter: Outlet T_o °F	Dry gas meter: Average T_d °F	Duration of test θ min	Vacuum setting in Hg	γ	ΔH@ in H_2O
0.5	5.000	785.700	70.3	74	70	72.8	12 41.7/60	10.5	1.007	1.83
		790.680	70.3	76	71					
1.0	11.000	791.100	70.3	76	71	75.0	20 06/60	10.0	1.004	1.89
		802.130	70.3	80	73					
1.5	11.000	802.505	70.3	80	73	77.0	16 36.8/60	12.0	0.999	1.93
		813.613	70.3	81	74					
2.0	11.000	813.800	70.3	81	74	77.8	14 14.3/60	11.0	0.995	1.89
		824.955	70.3	82	74					
3.0	11.000	825.500	70.3	82	74	78.8	11 45.9/60	11.5	0.993	1.93
		836.670	70.3	83	76					
4.0	16.000	836.400	70.3	83	76	79.8	14 52.1/60	10.0	0.991	1.94
		853.168	70.3	84	76					
								Average	0.998	1.90

γ must not deviate by more than ±0.02 γ.
ΔH@ must not deviate by more than 0.15 in H_2O.

ΔH	γ: $\frac{(V_w)(P_b)(T_d + 460)}{(V_d)(P_b + \Delta H/13.6)(T_w + 460)}$	ΔH@: $\frac{(0.0317)(\Delta H)}{(P_b)(T_d + 460)}\left[\frac{(T_w + 460)(\theta)}{(V_w)}\right]^2$
0.5	(5.000)(29.440)(532.8) / (4.980)(29.477)(530.3)	(0.0317)(0.5) / (29.440)(532.8) [(530.3)(12.695) / (5.000)]^2
1.0	(11.000)(29.440)(535.0) / (11.030)(29.514)(530.3)	(0.0317)(1.0) / (29.440)(535.0) [(530.3)(20.100) / (11.000)]^2
1.5	(11.000)(29.440)(537.0) / (11.108)(29.550)(530.3)	(0.0317)(1.5) / (29.440)(537.0) [(530.3)(16.613) / (11.000)]^2
2.0	(11.000)(29.440)(537.8) / (11.155)(29.587)(530.3)	(0.0317)(2.0) / (29.440)(537.8) [(530.3)(14.[illegible]) / (11.000)]^2
3.0	(11.000)(29.440)(538.8) / (11.170)(29.661)(530.3)	(0.0317)(3.0) / (29.440)(538.8) [(530.3)(11.765) / (11.000)]^2
4.0	(16.000)(29.440)(539.8) / (16.268)(29.734)(530.3)	(0.0317)(4.0) / (29.440)(539.8) [(530.3)(14.868) / (16.000)]^2

Figure E-7g. Particulate sampling meter box initial calibration.

DATE: 12/6/82

BAROMETRIC PRESSURE (P_{bar}): 29.48 in. Hg

PLANT: MONO POWER/ PLEASANTS STA.

PROJECT MANAGER: J. PROHASKA

METER BOX NO.* FB-8 #PUMP #6

PRETEST Y: .998 ΔH@: 1.90

PROJECT NO. 3530-15

CALIBRATOR: E. ANTIESBERGER

Orifice manometer setting * ΔH in. H_2O	Wet test meter volume V_w ft^3	Dry gas meter volume V_d ft^3	Temperatures: Wet test meter T_w °F	Temperatures: Dry gas meter Inlet T_{di} °F	Temperatures: Dry gas meter Outlet T_{di} °F	Temperatures: Dry gas meter Average T_d °F	Vacuum setting ** in. Hg	Duration of run Ø min	Y	ΔH@
3.0	11	095.832	74.5	70	66	69.25	10	11.56	1.002	1.92
		106.615	74.5	73	68					
3.0	10	106.615	74.5	73	68	71.75	10	10.54	.999	1.925
		116.490	74.5	76	70					
3.0	13	116.490	74.5	76	70	74.25	10	13.71	.999	1.91
		129.389	74.5	79	72					
								Post-test average***	1.000	1.92

Y	ΔH@
$\frac{(V_w)(P_{bar})(T_d + 460)}{(V_d)(P_{bar} + \Delta H/13.6)(T_w + 460)}$	$\frac{(0.0317)(\Delta H)}{(P_{bar})(T_d + 460)}\left[\frac{(T_w + 460)(\theta)}{(V_w)}\right]^2$
$\frac{(11.000)(29.48)(529.25)}{(10.783)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(529.25)}\left[\frac{(534.5)(11.56)}{(11.000)}\right]^2$
$\frac{(10.000)(29.48)(531.75)}{(9.815)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(531.75)}\left[\frac{(534.5)(10.54)}{(10.000)}\right]^2$
$\frac{(13.000)(29.48)(534.25)}{(12.899)(29.70)(534.5)}$	$\frac{(.0317)(3.0)}{(29.48)(534.25)}\left[\frac{(534.5)(13.71)}{(13.000)}\right]^2$

*To be the average ΔH used during the test series.
**To be the highest vacuum used during the test series.
***Post-test Y must be within the range, pre-test Y ±0.05Y
Post-test ΔH@ must be within the range, pre-test ΔH@ ±0.15

PUMP #6 WAS USED WITH FB-8 METER BOX

Figure E-7h. Particulate sampling meter box post-test calibration.

THERMOCOUPLES

Thermocouples were calibrated by comparison against an ASTM-2F thermometer at approximately 32°F, ambient temperature, 100°F, and 500°F. The thermocouples read within 1.5 percent of the reference thermometer throughout the entire range when expressed in degrees Rankine. If a thermocouple did not read within 1.5 percent, a correction formula based on a least squares analysis of the data was utilized. The correction formula corrected the data 1.5 percent. Each thermocouple was checked at ambient temperature at the test site to verify the calibration. Calibration data are presented in Figure E-8.

DIGITAL INDICATOR FOR THERMOCOUPLE READOUT

A digital indicator was calibrated by feeding a series of millivolt signals to the input, and comparing the indicator reading with the reading the signal should have generated. Error did not exceed 0.5 percent when the temperatures were expressed in degrees Rankine. Calibration data are shown in Figures E-9a and b.

DRY GAS THERMOMETERS

The dry gas thermometers were calibrated by comparison against an ASTM-2F thermometer at approximately 32°F, at ambient temperature, and at approximately 110°F. The thermometers agreed within 5°F of the reference thermometer. The impinger thermometers failed to calibrate after the test series. The greater deviation was -10°F which exceeded the tolerance level of -5°F.

Date: 5/13/80 Thermocouple No.: 201

Ambient temperature: 79 °F Barometric pressure: 29.29 " Hg

Calibrator: B Armstrong Reference: ASTM-2F

Reference point No.	Source,* (specify)	Reference thermometer temperature, °F***	Thermocouple temperature, °F	Difference, %**
1	2	78	77	0.19
2	1	35	36	-0.20
3	3	106	107	-0.18
4	3	490	554	-6.74

Correction factor****: Slope: 0.8645 Intercept: 9.00

Reference point No.	Reference thermometer temperature, °F	Corrected thermocouple temperature, °F	Difference, %**
1	78	76	0.37
2	35	40	-1.61
3	106	102	0.71
4	490	491	-0.11

Critical test points are 32°, 100°, and 500°.

*Source: 1) Ice bath
2) Ambient
3) Furnace

**Percent difference

$$\frac{\text{Reference temp. °F - thermocouple temp. °F}}{\text{(Reference temp. °F + 460°F)}} \times 100$$

Each percent difference must be less than or equal to 1.5%.

***Reference thermometer must be ASTM.

****Correction factor must be determined if any percent difference is >1.5%.

Figure E-8. Thermocouple calibration data sheet.

Date Nov 15, 1952 Indicator No. #124 Operator David K. Fitzgerald

Test Point No.	Millivolt signal*	Equivalent temperature, °F*	Digital indicator temperature reading, °F	Difference, %
0	**	76	73.8	0.41%
1		32.0	30.6	0.23%
2		102.2	100.1	0.37%
3		451.1	450.1	0.11%
4		1127.0	1129.5	0.16%

Percent difference must be less than or equal to 0.5%.

Percent difference:

$$\frac{(\text{Equivalent temperature } °R - \text{Digital indicator temperature reading } °R)(100\%)}{(\text{Equivalent temperature } °R)}$$

Where °R = °F + 460°F

*See thermocouple digital indicator calibration verification device calibration for these values.

**This point is ambient temperature. The device is off and therefore is supplying no signal other than ambient temperature.

Figure E-9a. Thermocouple digital indicator calibration data sheet.

Date Nov. 18, 1982 Indicator No. #125 Operator Daniel E. Fitzgerald

Test Point No.	Millivolt signal*	Equivalent temperature, °F*	Digital indicator temperature reading, °F	Difference, %
0	**	75	74.4	0.11%
1		32.0	31.6	0.08%
2		102.2	100.9	0.23%
3		451.1	449.9	0.13%
4		1127.0	1127.3	-0.02%

Percent difference must be less than or equal to 0.5%.

Percent difference:

$$\frac{(\text{Equivalent temperature } °R - \text{Digital indicator temperature reading } °R)(100\%)}{(\text{Equivalent temperature } °R)}$$

Where °R = °F + 460°F

*See thermocouple digital indicator calibration verification device calibration for these values.

**This point is ambient temperature. The device is off and therefore is supplying no signal other than ambient temperature.

Figure E-9b. Thermocouple digital indicator calibration data sheet.

Calibration data are included in Figures E-10a through d and E-11a through d.

BALANCE

The Mettler electronic balance was calibrated by comparison with Class-S standard weights and agreed within 0.5 g. Calibration data are shown in Figure E-12.

BAROMETER

The field barometer was calibrated to within 0.1 in.Hg of an NBS-traceable mercury-in-glass barometer before each test series. The field barometer was checked against the mercury-in-glass barometer after each test series to determine if it read within 0.2 in.Hg. If it did not reading within 0.2 in.Hg, a correction factor was determined. Calibration data are included in Figure E-13.

ORSAT ANALYZER

The orsat analyzer was calibrated before each test series by determining the percentages of carbon dioxide and oxygen in a calibration gas containing known percentages of each. The analyzer read within 0.5 percent of the known value for each gas. Calibration data are shown in Figures E-14a and b.

Date: 6/10/80 Meter Box No.: FB-3

Calibrator: B. Armstrong Reference: ASTM-2F

Inlet

Reference point No.	Source *	Reference thermometer temperature, °F	Dry gas thermometer temperature, °F	Difference, °F**
1	2	72.0	72	0.0
2	1	32.7	32	0.7
3	3	116.0	113	3.0

Outlet

Reference point No.	Source *	Reference thermometer temperature, °F	Dry gas thermometer temperature, °F	Difference, °F**
1	2	72.0	71	1.0
2	1	32.7	30	2.7
3	3	114.0	112	2.0

*Source: 1) Ice bath
2) Ambient
3) Water bath

**Difference must be less than or equal to ±5°F.

Figure E-10a. Dry gas thermometer calibration data sheet.

Date: 6/10/80 Meter Box No.: FB-4

Calibrator: E. Armstrong Reference: ASTM-2F

Inlet

Reference point No.	Source *	Reference thermometer temperature, °F	Dry gas thermometer temperature, °F	Difference, °F**
1	2	72.0	72	0.0
2	1	32.7	32	0.7
3	3	117.0	114	3.0

Outlet

Reference point No.	Source *	Reference thermometer temperature, °F	Dry gas thermometer temperature, °F	Difference, °F**
1	2	72.0	73	1.0
2	1	32.7	34	1.3
3	3	116.0	115	1.0

*Source: 1) Ice bath
2) Ambient
3) Water bath

**Difference must be less than or equal to ±5°F.

Figure E-10b. Dry gas thermometer calibration data sheet.

Date: 6/10/80 Meter Box No.: FB-5

Calibrator: B. Armstrong Reference: ASTM-2F

Inlet

Reference point No.	Source *	Reference thermometer temperature, °F	Dry gas thermometer temperature, °F	Difference, °F**
1	2	72.0	76	4.0
2	1	32.7	35	2.3
3	3	108.0	106	2.0

Outlet

Reference point No.	Source *	Reference thermometer temperature, °F	Dry gas thermometer temperature, °F	Difference, °F**
1	2	72.0	73	1.0
2	1	32.7	34	1.3
3	3	117.5	115	2.5

*Source: 1) Ice bath
2) Ambient
3) Water bath

**Difference must be less than or equal to ±5°F.

Figure E-10c. Dry gas thermometer calibration data sheet.

Date: 11/4/80 Meter Box No.: FB-8

Calibrator: Dan Fitzgerald Reference: ASTM-2F

Inlet

Reference point No.	Source *	Reference thermometer temperature, °F	Dry gas thermometer temperature, °F	Difference, °F**
1	2	36	38	2
2	1	73	74	1
3	3	109	109	0

Outlet

Reference point No.	Source *	Reference thermometer temperature, °F	Dry gas thermometer temperature, °F	Difference, °F**
1	2	36	33	3
2	1	73	72	1
3	3	109	105	3

*Source: 1) Ice bath
2) Ambient
3) Water bath

**Difference must be less than or equal to ±5°F.

Figure E-10d. Dry gas thermometer calibration data sheet.

Date: 12/16/85 Thermometer No.: #1 OR A

Ambient temperature: 76° °F Impinger: yes NO_x: no

Calibrator: [illegible] Reference: ASTM-3F

Reference point No.	Source *	Reference thermometer temperature, °F	Thermometer temperature, °F	Difference, °F**
1	2	74°F	72°F	2°F
2	1	36°F	30°F	6°F

*Source: 1) Ice Bath
2) Ambient

**Difference must be less than ±2°F at both points

Figure E-11a. Thermometer calibration data sheet.

Date: 12/16/82 Thermometer No.: #2 or B

Ambient temperature: 7[illegible] °F Impinger: [illegible] NO_x: [illegible]

Calibrator: R. [illegible] Reference: [illegible]

Reference point No.	Source *	Reference thermometer temperature, °F	Thermometer temperature, °F	Difference, °F**
1	2	74°F	71°F	3°F
2	1	36°F	32°F	4°F

*Source: 1) Ice Bath
2) Ambient

**Difference must be less than ±2°F at both points

Figure E-11b. Thermometer calibration data sheet.

Date: 2/16/82 Thermometer No.: #3 of C

Ambient temperature: 76° °F Impinger: YES NO_x: [illegible]

Calibrator: R ANTESBERGER Reference: ASTM-3F

Reference point No.	Source *	Reference thermometer temperature, °F	Thermometer temperature, °F	Difference, °F**
1	2	74°F	66°F	8°F
2	1	36°F	26°F	10°F

*Source: 1) Ice Bath
2) Ambient

**Difference must be less than ±2°F at both points

Figure E-11c. Thermometer calibration data sheet.

Date: 12/16/85 Thermometer No.: #4 or D

Ambient temperature: 76° °F Impinger: YES NO_x: NO

Calibrator: P ALTENBERGER Reference: ASTM-3F

Reference point No.	Source *.	Reference thermometer temperature, °F	Thermometer temperature, °F	Difference, °F**
1	2	74°F	69°F	5°F
2	1	36°F	26°F	10°F

*Source: 1) Ice Bath
2) Ambient

**Difference must be less than ±2°F at both points

Figure E-11d. Thermometer calibration data sheet.

Balance No.	Date	Calibrator	Mass determined for					
			~~5~~ 200 g	Error	~~50~~ 500 g	Error	~~100~~ 1000 g	Error
M-1*	12/7/82	D. Osterhout	200.1	+0.1	500.2	+0.2	1000.4	+0.4

Error must not exceed 0.5 grams at each point.

* Balance was also calibrated by manufacturer on 10/6/82.

Figure E-12. Balance calibration data sheet.

BAROMETER NO.	#226	#317					
	5051 5242 Nat. D.St.	3530-15 USEPA					

PRETEST

BAROMETER READING	30.00	29.59					
REFERENCE BAROMETER READING	29.98	29.59					
DIFFERENCE*	0.02	0.00					
DATE	11-15-82	11-19-82					
CALIBRATOR	[signature]	[signature]					

POST-TEST

BAROMETER READING							
REFERENCE BAROMETER READING							
DIFFERENCE**							
DATE							
CALIBRATOR							

*Barometer is adjusted so that difference does not exceed 0.05 in. Hg.
**Barometer is not adjusted. If difference exceed 0.10 in. Hg, inform project manager immediately.

Figure E-13. Barometer calibration log.

Reference Gas: AGA Burdox
Cylinder No. 112704
Invoice No. 0382088
Lab Ref. No. VII:46-23

Orsat No.: 141

Gas (circle one): O_2 (CO_2) CO

Calibrator	Date	Value Det.
D. [illegible]	10.11.82	4.8
R. AUTESBERGER	11/20/82	4.7

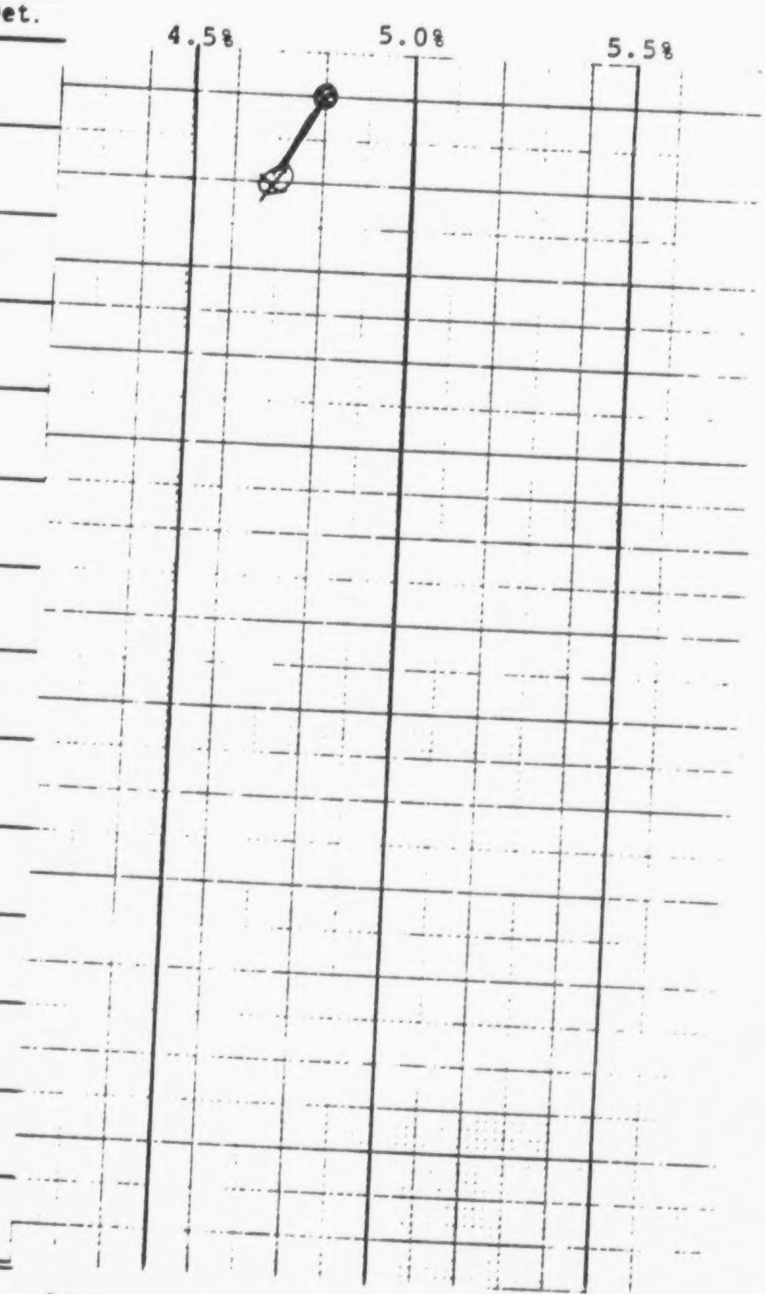

Figure E-14a. Orsat calibration data sheet - CO_2.

Reference Gas: AGA Burdox
Cylinder No. 112704
Invoice No. 0382088
Lab Ref. No. VII:46-23

Orsat No.: "L"

Gas (circle one): (O_2) CO_2 CO

Calibrator	Date	Value Det.
D. Schaffel	10-11-82	4.8
R. Anderson	11/20/82	5.4

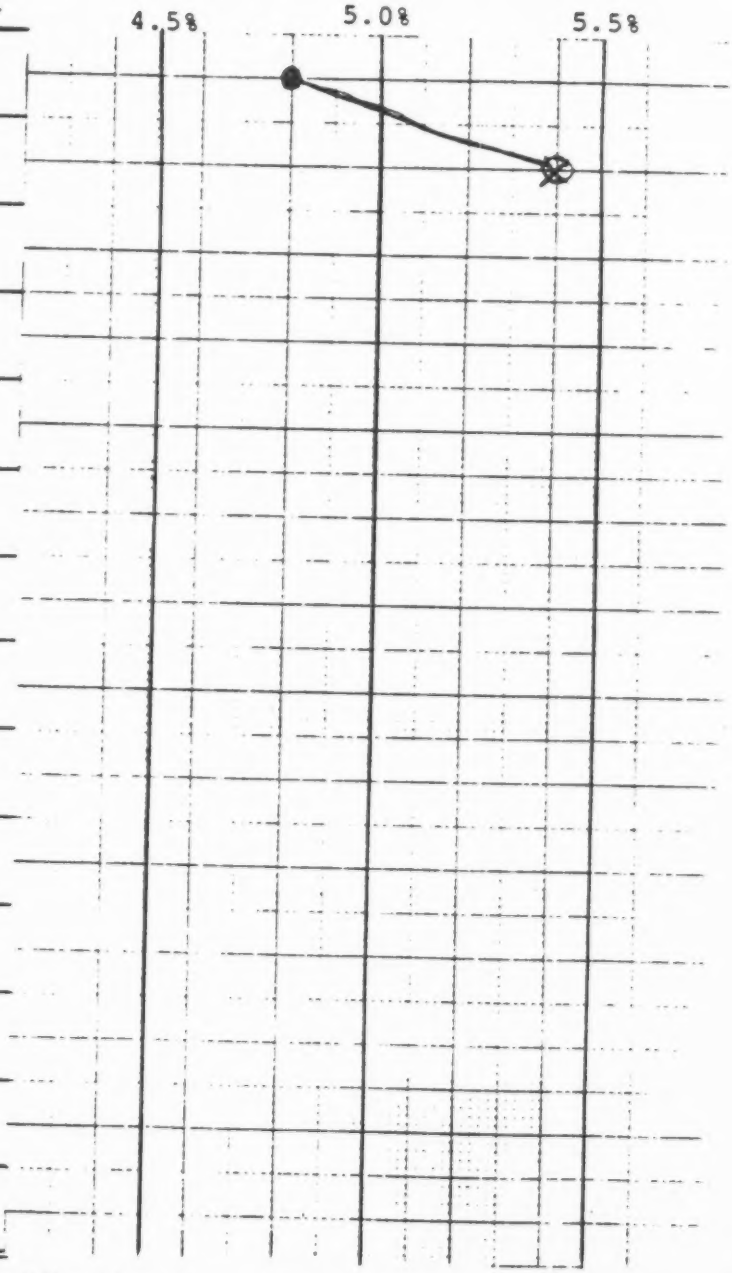

Figure E-14b. Orsat calibration data sheet - O_2.

APPENDIX F

QUALITY ASSURANCE SUMMARY

QUALITY ASSURANCE

The following summary addresses the general steps taken to insure data quality and accuracy for any given emission test project.

PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization and responsibilities of the project team are generally defined in the test plan. Specific responsibilities for this field test are shown in Appendix G, Project Participants.

QUALITY ASSURANCE OBJECTIVE

The primary objective of this program is to refine sampling and analytical techniques of EPA Proposed Method 5B (or develop a new method) that will minimize the collection of condensible sulfate materials in the measurement of particulate emissions from fossil fuel-fired boilers and to evaluate method precision. Therefore, all procedures used in the collection and analysis of emission samples were as outlined in applicable EPA reference methods, where applicable. The sample methodology used for this project (quad train - single point) has been previously validated specifically for research and methods development type projects.

Test results were presented in several units to allow for their comparison with data from other organizations wishing access to the data summary.

DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction and reporting provide one of the greatest potential sources of system error. To help minimize this source of error, PEDCo performs most test method calculations by use of a validated computer program. In addition, hand calculation on standard computer cards to allow accurate input of data into the computer by individuals unfamiliar with testing procedures. The data printout is then validated by comparison with the field and analytical data sheets. In addition, hand calculation checks generally are made to validate the computer output. Other data validations are made whenever possible.

PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

When feasible, PEDCo performs both performance and system audits. Three types of performance audits were performed for this test program. All dry gas meter systems were audited for accuracy in the field by the use of a critical orifice. In addition, the analytical procedure for sulfur dioxide was audited for accuracy by the use of audit samples supplied by EPA prior to sample analysis. Also, onsite calculations were used to check the completeness and accuracy of the particulate test data.

SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

Because the precision of the standard EPA reference methods used had previously been determined, no further attempt was made to assess data precision. These precision results are summarized in "The EPA Program for the Standardization of Stationary Source Emission Test Methodology, A Review," EPA-600/4-76-044. Precision estimates were calculated for within-run M5B and M5B-P400 samples using standard statistical analysis procedures. The mean concentration and standard deviation (with N-1 weightings for sample data) were determined for each group of similar runs. The standard deviations were expressed as a percentage of the mean concentration for comparison purposes (in this form the standard deviation was called a coefficient of variance).

Three audit procedures were used to determine accuracy. Accuracy audit procedures used for the dry gas meter and sulfur dioxide, analysis are the standardized written procedures used by the EPA Quality Assurance Division program. The procedure for determining data completeness is the same as that for New Source Performance Standards, as documented in the Code of Federal Registers 40 CFR 60, Section 60.8.

INTERNAL QUALITY CONTROL CHECKS

Several internal quality control checks are usually made for each test. Normally, most of these checks deal with the field sampling analysis. For this test series, control samples for the sulfur dioxide analytical procedures were analyzed. Also, filter

and reagent blanks were returned to the laboratory for gravimetric analysis. A quality control check of both the initial and final weighing was thus provided. Results of the control sample checks are included in Section 6. Blanks were analyzed according to procedures used for the M5BW and IC analytical work.

CORRECTIVE ACTION

PEDCo has two methods for corrective action. The first involves the use of control limits, such as audit sample results, control sample results, and calibration results. When any of these limits show that the integrity of the data is questionable the procedure is repeated, additional data are collected, or the data are rejected. The second method involves the use of red tags. Whenever any piece of equipment is suspected of producing unacceptable data, the entire apparatus or malfunctioning component is replaced and a red tag is placed on the item. That piece of equipment is then rejected until its ability to perform its function correctly is verified by the proper individuals. The use of numerous control limits and the red tagging system reduces the amount of unacceptable data and provides a system by which to track and correct items and procedures that show an unusally high occurrence of unacceptability.

PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

PEDCo has a very comprehensive preventive maintenance program. Many of the major components of test equipment have pretest checklists. These checklists ensure that all functions are

checked and action is taken to repair or replace any part that shows probability of malfunction. The checks are made before every field test series, however, only the control console (meter box) check are recorded. Even though PEDCo's preventive maintenance program and schedule are not in writing, our commitment of three full-time experienced persons for the express purpose of equipment construction, preparation, calibration, and maintenance has created a program based on experience and skill that cannot be matched by a written guideline.

QUALITY ASSURANCE REPORTS TO MANAGEMENT

The standard quality assurance procedures used in this test program generated sufficient documentation to indicate the data quality. All evidence of the execution of the quality assurance guidelines is reviewed by management. In addition, during weekly meetings of all PEDCo's EMB task managers and project managers, all aspects of the project are discussed including the quality assurance of each task. No written report results from this meeting because all interested parties are verbally apprised of the situation during each meeting.

Two other reports are made to managements, which are not EMB task related. PEDCo's emission test and laboratory groups participants in all national audits by EPA's Quality Assurance Division, and PEDCo's quality assurance cocrdinator, Tom Wagner, makes several independent checks for management.

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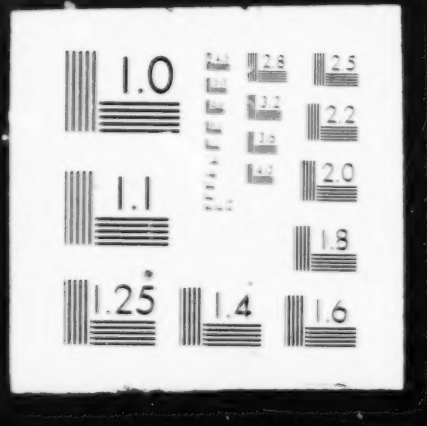

APPENDIX G

PROJECT PARTICIPANTS AND SAMPLE LOG

TABLE G-1. FIELD TEST CREW AND RESPONSIBILITIES

Name	Title	Field test assignment
J. Prohaska*	Project Manager	Coordinate test activity; sample train setup and disassembly
D. Osterhout*	Engineer	Site leader; particulate tests at outlet stack; meter reader, quad train assembly and disassembly
M. Phillips	Engineer	Site leader; clean up area; setup and recover sample trains, orsat analysis
R. Antesberger*	Technician	Setup and recover sample trains; assist in quad train assembly and disassembly
P. Clarke	Engineer	Particulate tests; meter reader, quad train assembly and disassembly

*Denotes site setup crew.

TABLE G-2. SAMPLE LOG

Date (1982)	Activities
November 22-23	Sample site and equipment setup. All initial measurements were obtained. Sample recovery and setup area organized.
November 29	Two test runs were performed.
November 30-December 1	Three test runs per day were performed.
December 2	Two test runs were performed. Packed equipment and left site.